N. A. Wood,

Vol. XLIV JUNE, 1932 No. 2

THE WILSON BULLETIN

A Magazine of Field Ornithology

Published by the
WILSON ORNITHOLOGICAL CLUB
at
SIOUX CITY, IOWA

Entered as Second-class Mail Matter, July 13, 1916, at the Postoffice at Sioux City, Iowa, under Act of March 3, 1879.

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Published quarterly, in March, June, September, and December, as the official organ of the Wilson Ornithological Club, at Sioux City, Iowa.

The current issue of the Wilson Bulletin is printed by the Verstegen Printing Company, Sioux City, Iowa.

The Wilson Bulletin is sent to all members not in arrears for dues. The subscription price is $1.50 a year, invariably in advance, in the United States. Outside of the United States the subscription rate is $1.75. New subscriptions, change of address, and applications for membership should be addressed to the Secretary.

All articles and communications for publication, books and publications for notice, and exchanges, should be addressed to the Editor.

Claims for lost and undelivered copies of the magazine may be addressed to the Editor.

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THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY
Published by the Wilson Ornithological Club

Vol. XLIV JUNE, 1932 No. 2

Vol. XXXIX (New Series) Whole Number 159

WINTER STARLING ROOSTS OF WASHINGTON

BY E. R. KALMBACH

The winter Starlings of Washington are in no wise different from other Starlings. They are as typically Starlings as the cosmopolitan citizenry of the National Capital is American. They have all the individual vices, much of the proletarian spirit and doubtless also some of the less frequently mentioned virtues of Starlings living elsewhere. Yet,, withal, they have distinction. The mere choice of the National Capital as their winter domicile assures them that.

Here their nocturnal squeals and chatterings reach the ears of the mighty and here also at times the voices of the mighty rise in protest. Here the shopper and the shop owner; the pedestrian and autoist; the bird hater and even bird lover periodically join the chorus of damnation. Even the staid ranks of profound ornithologists have echoed the song of lament.

It is in such an unsympathetic setting that the appended notes on Starling behavior have their origin. They are devoted in general to the subject of roosting activities and in origin are more or less of a by-product of a few experiments in control. In point of time they deal largely with the happenings of the past five years.

Winter Starlings made their first appearance in Washington in the fall of 1914, when a few score used trees near the Bureau of Fisheries as a rendezvous. At that time they were objects merely of ornithological interest and made no impression on the lay mind except as attention was called to their presence. On the advent of colder weather these birds either left the city for points south or passed the nights in more protected and less conspicuous places, as the interiors of church towers or building ventilators. It was not until about 1922 or 1923 that noticeable numbers began to frequent the eaves and window ledges of buildings on down-town streets and formed a nucleus of what in following years developed into a roost of many thousands.

By January, 1926, the gathering had reached such proportions that local merchants complained of its presence, and, in a limited way,

experiments were started to alleviate the condition. These early experiments, involving frightening measures, were followed by attempts to trap the birds, then to poison, and finally experimental work was done with toxic gas on small mixed roosts of Starlings and English Sparrows. The rather high degree of failure, tempered with indifferent success in a few of the experiments, carried with it the conviction that there still was much to learn of Starling behavior that might have a bearing on the general problem of Starling control where needed. Of primary importance was the need of a better understanding of Starling migration or seasonal drift in order that the effect of a winter reduction of numbers at any one point might better be appraised. This led to banding operations.

The first of these attempts to band winter Starlings in Washington was directed at a group roosting in two ventilators on top of the Post Office Department Building on Pennsylvania Avenue. There were four of these ventilators, essentially the same in construction. Starlings, however, occupied only two, these being the ones from which a steady flow of warm air emerged throughout the night, and where the birds, protected from rain and snow by the broad, overlapping shutters, enjoyed the advantages of almost human comforts. Fully a thousand birds resorted to each of these ventilators during the height of their occupancy in the winter of 1927-28. On December 21, 1927, a party of four, consisting of C. C. Sperry, F. M. Uhler, F. C. Lincoln, and the writer visited these ventilators and succeeded in capturing a single Starling. There was no method of reaching the birds from the inside and the diffused light of the city made our approach from without so evident that most of the flock took wing at the start of operations. This single experience was sufficient and the scene of operations was promptly changed to the tower of the First Presbyterian Church on John Marshall Place where, during this same winter, as many as 2600 Starlings repaired nightly. This tower had been used by Starlings for several years and by pigeons for many more. The former were contributing rapidly to the supply of guano which on some landings was eight to ten inches deep. About a quart of this material yielded the remains of no less than 105 specifically different food items of the Starlings. More than half of these were animal in origin and the varied assortment gave indication of the wide daily rangings of this flock up and down the Potomac and throughout neighboring Maryland and Virginia.

Banding was begun at this location on the night of January 4, 1928, when 317 were banded. An even thousand were tagged on Janu-

ary 14 and another thousand on February 21. The peak of operations was reached on the night of March 2 with the banding of 1,241, and the season closed on March 23 with 559, making a total of 4,118 for the winter. In the following winter (1928-29) 398 additional Starlings were caught and banded in the tower of the Metropolitan Me-

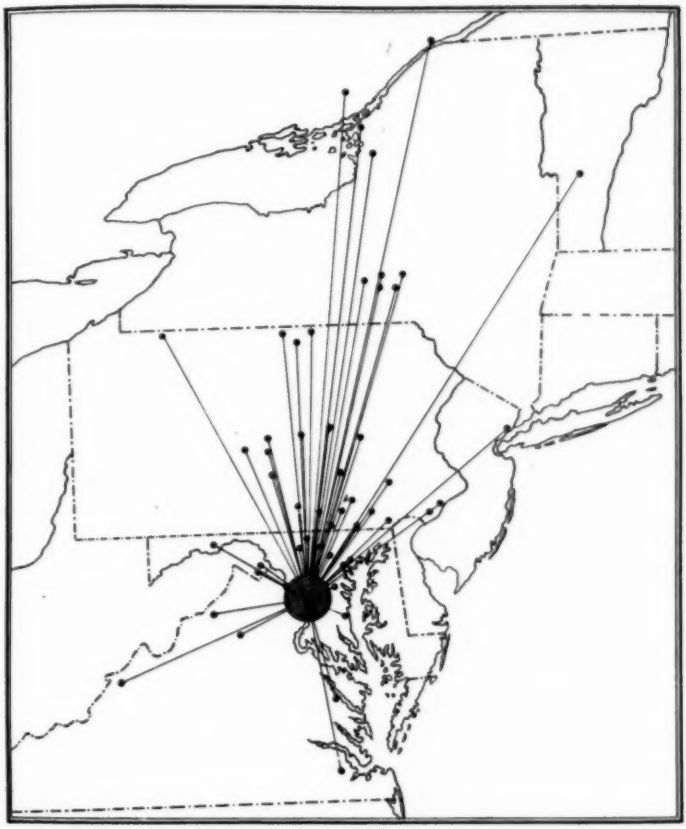

FIG. 14. Map showing the 120 returns from 4,516 Starlings banded in Washington in the winters of 1927-28 and 1928-29. Seventy birds were recovered at points within the shaded circle, having a radius of twenty miles from the point of banding. The most distant return (Cornwall, Ontario) is about 480 miles distant from Washington.

morial M. E. Church, situated only a half block from the scene of the earlier banding. In the course of this work a number of Washington ornithologists other than those mentioned, coöperated.

At the time of this writing (March, 1931) 120, or about 2.6 per cent of the total number of Starlings banded in these two winters

(4516) have been recorded as returns. (See Fig. 14). Seventy of these returns have been recorded from points less than twenty miles distant from the point of banding. Of these seventy essentially local returns, twenty-eight were recorded during subsequent breeding seasons and for that reason may be looked upon as resident birds. A portion also of the other forty-two local returns, birds captured or killed during winter months, probably were local breeders. Arguing from these admittedly meager data, it may be contended that something more than 23 per cent of the wintering Starlings of Washington were essentially resident birds. For that reason a reduction in the number of winter Starlings at Washington may be expected to exert a certain influence on the local breeding population but, of the birds eliminated, probably more than half would be northern breeders. Wallingford, Vt., Cape Vincent, N. Y., and Cornwall and Elgin, Ontario, are the most northerly points of return among the birds banded. The few records of return noted in Fig. 14 at points to the south of Washington are of birds captured during subsequent winters and indicate possibly that those individuals had merely gone on past Washington in their southern drift toward warmer climes.

The Starlings in the first of the towers visited, which is an old one, occupied various ledges and nooks in the walls as well as the cross braces. At a certain level there was a series of box-like cavities in the wall construction, each about two feet wide, three feet deep, and six inches high. These were filled with Starlings for their entire depth with scarcely room for another, and, despite an outdoor temperature of well below freezing, I am confident a thermometer placed among these birds would have registered a temperature close to that of their own bodies. We ourselves were able to keep perfectly comfortable, even though working bare-handed on cold nights, by frequently delving arms' length into one of these cavities to drag forth a double handful of Starlings. This habit of dense crowding is quite different from that displayed by Starlings when roosting in trees or on the exterior of some buildings where there is ample room. In such locations the birds appear to resent close association and aim to keep between each other a space equal to at least the width of a bird. (Fig. 15). The intrusion of another individual into a line at such a gathering is resisted, but if the newcomer is successful in establishing itself there follows a slight shifting of birds on each side in an attempt to equalize and keep at a maximum the interval between each.

Each successive night of banding at the church tower disclosed a certain number of "repeats" from our earlier bandings. It was also

FIG. 15. A count made from the negative of this picture reveals about 1,000 Starlings in the top of this sycamore tree on Pennsylvania Avenue, Washington. The photograph was taken before sunrise.

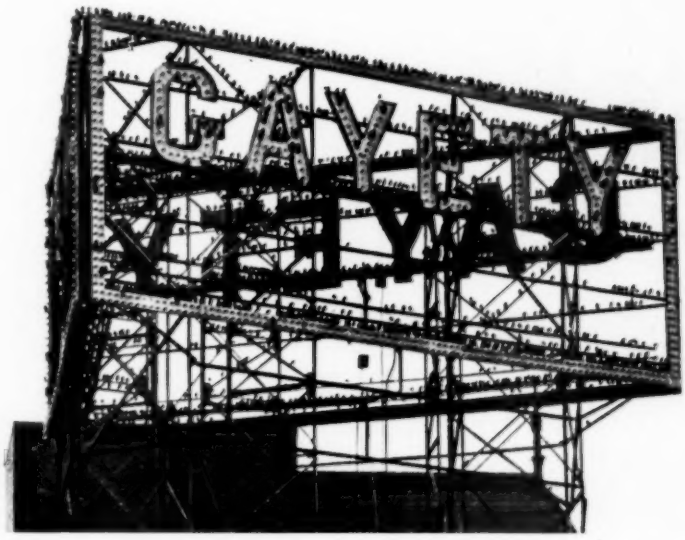

FIG. 16. "Gayety" is the keynote of this assemblage of approximately 3,000 Starlings on the top of a burlesque theatre in Washington.

Photographs by E. R. Kalmbach.

apparent that these operations were causing a decrease in the total population of the tower as we had to go to higher and higher levels to obtain the birds. It was not until the last banding of the first year (March 23, 1928) that we were able to capture practically every bird in the tower. On that evening it was necessary to climb to the very top of the cupola to obtain the last two hundred birds. Among these last birds *there was not a single "repeat"* although for that entire evening "repeats" averaged close to a fifth of the birds handled. Even previous to this night it had been noted that there was a tendency for the numbers on the "repeats" to be bunched in a fairly close sequence, much in the order in which they were originally banded. A group of fifty birds removed from one cavity might have six or eight "repeats" and the numbers of these repeats often were in close proximity in the numerical series, indicating, it was thought at that time, that each individual bird had returned to the same spot in the tower that it had occupied at the time it was banded. The absence of "repeats" among the last two hundred birds obtained from the peak of the cupola, which had not been visited before, strengthened this belief.

With the decrease in the number of birds in this tower, came an approximately corresponding increase in the number of Starlings using the ledges beneath the eaves and porticos of the former Land Office and the Patent Office buildings about one-fourth mile to the northwest. A few hundred also repaired to the tall spire of the Metropolitan M. E. Church just a half block to the south. This latter tower was the scene of the banding operations during the following winter (1928-29) when, after two "expeditions" on which 398 were banded, it also became unattractive to the birds. Today, three or four years after these operations, the two towers mentioned remain nearly free of Starlings, despite the fact that they are just as accessible as they ever were and that the local Starling population of Washington still is great.

Although the treatment given the birds when being banded was a bit rough at times, it was not more than the rugged Starling could ordinarily withstand. They were gathered in gunny sacks in lots of forty or fifty, brought down to a lower level, inspected for bands previously placed, banded and then released by tossing them out of a window. This compelled the birds to seek other more peaceful spots of repose for the rest of the night. Inspection of the premises by day on several occasions revealed only one dead Starling that had been handled on the previous night. There certainly was no great mortality. The summary ejection of the birds from the tower with the resultant

necessity on their part of finding new nightly abodes appeared to be the impelling factor that caused the desertion of these roosts. In one of the two towers a carillon of bells, on the framework of which many of the birds roosted, was in no sense a disturbing factor as not a bird was seen to leave the tower while Christmas carols and glad tidings of the new year were being tolled.

After the center of Washington's Starling population had moved to the old Land Office Building late in the winter of 1927-28, observations and certain control experimental work shifted to that scene. Here the birds occupied protected ledges beneath the eaves and on the frames of the upper story windows. The capital of every Corinthian column also had its quota and the regular dispersal of the birds in measured spaces permitted easy estimation of numbers. During the peak of occupancy in the winter of 1929-30, this building harbored nightly about 4,200 Starlings. Here further and more definite evidence of the attachment shown by individual Starlings for the same roosting spot was revealed. It came to light in connection with an experimental demonstration of a scheme to reduce the nuisance of roosting Starlings by eliminating the roosting ledges. The tops of the upper story windows across the entire south side of the old Land Office Building were occupied, each with its ten to fifteen birds. One of these roosting sites was eliminated by placing on the ledge a strip of wood having an end cross section of a right triangle and a length equal to the width of the window. In this manner an inclined surface sloping outward and downward at an angle of 45° from the horizontal displaced the flat ledge about three inches wide. On this incline the birds could not, or at least did not roost. This strip was placed in position on March 14, 1928, where it remained until the night of the 16th, when it was dislodged by the wind. On the night of the 17th every window of the upper story had its regular quota of birds in orderly array except the one on which the strip had formerly rested. This ledge remained absolutely free of Starlings notwithstanding the fact that now it was just as suitable as any other ledge and that there were mad scrambles for lodging space on neighboring windows scarcely eight feet away. On the night of the 18th one bird timidly occupied the extreme end of the vacated ledge and on following nights it was gradually repopulated.

At about the same time a somewhat similar experience was had with Starlings occupying a portico at the opposite end of this building. An automatic acetylene flash gun was fired in this portico for several consecutive nights causing a portion of the birds to seek quieter lodgings. The results were not as successful as hoped for and the

firing was stopped. The birds, however, did not return to the vacated ledges immediately and it was only after a period of several days that the area was slowly reoccupied.

A more recent happening emphasizes further the fact that once a Starling has been driven from a roosting spot and *has located itself at some other point* there is no urge to return to its earlier roost unless driven from its new abode. It occurred at the scene of this same center of Starling population, which had grown to considerable proportions and occupied not only all four sides of the old Land Office Building but also parts of the Patent Office to the north. On the 9th of February, 1931, a crew of eight men, four to each building, started a crusade against the roosting birds. Cat-o-nine tail whips of short poles with several strands of flexible wire attached were used to lash the ledges beneath the eaves. The men operated from the roof of the building. This was repeated on a second night and the work was supplemented by some of the men using "bean shooters", with small stones as projectiles, to dislodge birds that could not be reached with the whips. By the third night the roost was much reduced in size and the whips were abandoned entirely for the sling shots. The crew also was reduced to two men for each building. By the fourth night practically all the birds had left and two men leisurely patrolling from the sidewalk kept the few more persistent birds on the move.

Since then, these two buildings, which together harbored probably in excess of 6,000 birds, have been free of Starlings. It is true a single man goes through the perfunctory procedure of patrol but it is not needed. There is a complete avoidance of the building on the part of the birds. Now and then a small group will fly toward it as if to alight on one of the ledges; they may even perch for a moment or two but it is not for long. As far as these two buildings are concerned the relief from the Starlings has been complete. Yet immediately across the street an electric sign, gaily occupied by the birds, afforded lodging for about 3,000 (Fig. 16), a few of which showed any interest in or inclination to return to their old ledges scarcely 100 feet away. The rest of the evicted tenants found other spots in down-town Washington with a noticeable drift westward along F and G Streets. Even the District Building about a half mile away, from which the Starlings departed about a year previous in response to frightening measures, again had a substantial delegation. Each individual Starling could be expected to return to its own newly found nook or cranny and the old stands at the Patent Office, the old Land Office Building, as well as at the church towers previously mentioned will likely remain

unoccupied as long as the birds are *not further disturbed* at their new locations.

The affinity of Starlings for individual roosting spots seems to account for the sequence of events occurring at roosts in the course of a single winter, or even a series of winters, if we assume there to be a certain homing instinct lasting from one season to another. A group of adult birds, returning to old haunts, might well be expected to decoy the young of the previous breeding season and in that manner a winter roost might be maintained at the same location for a series of years.

The idea of a particular roosting spot for each individual bird is, I find, at variance with the popular conception of large Starling roosts. To the casual observer these congregations convey the impression of a mad scramble to find roosting spots. There is, in fact, a scramble but behind it all there exists, I believe, the impelling desire of each bird to find its own particular location. Admittedly there is confusion, especially when there are new arrivals at the roost or when the roosting birds have been disturbed by man or other causes. But, all in all, these nightly gatherings may be little more of a riot than what one sees at any football game when each of 50,000 or more spectators is attempting to plant himself in his own reserved seat before the start of the game.

There is need for more direct and positive evidence of the trait these observations have indicated largely in a circumstantial way. This could be obtained by observing, night after night, conspicuously marked birds. Just how one would succeed in capturing and marking Starlings at one of the open roosts where they could be watched from day to day, without unduly disturbing the group I cannot say. Starlings are remarkably uniform in appearance but I hope sometime to have the good fortune to locate one or more individuals that are distinguishable so that their movements may be readily detected.

Despite the constancy with which Starlings return night after night to an established abode, motives bordering either on fickleness or an astute sense of danger at times seem to govern their movements when they decide to vacate. The occupancy of a new roost then may take on the aspect of a deliberate and willful avoidance of their former rendezvous. An incident that well illustrates such a case occurred within recent years in a nearby community in Virginia. A mixed flock of English Sparrows and Starlings roosted, to the great distress of the owner of the property, in the ivy covering the brick walls of a large and stately dwelling. A plea for some relief led to an experiment in the use of calcium cyanide dust as a fumigant. This was

fairly successful and the roost was materially reduced in size but not eliminated. Several dozen birds still remained but, during the days following, these also gradually vacated the premises and sought other roosting places. For the remainder of that season and in subsequent years these ivy covered walls harbored neither English Sparrows nor Starlings, though all essential features that originally attracted the birds still remained.

Compared with the drastic action taken without success against some bird roosts, our activities against the Starlings roosting in the tower of the First Presbyterian Church in Washington were mild and inoffensive. Yet five nights of banding at widely scattered dates so offended Starling sensibilities that they all left and few ever returned. Even more decisive was the manner which the Starlings vacated the ventilators on the Post Office Building. One night's visit of a banding party seemed sufficient to cause a rapid decrease in numbers on following nights until the roost was utterly forsaken.

A similar reaction has been noted with other species. I have known Crows to vacate enormous roosts apparently through the loss of a comparatively few birds through poisoning. Red-winged Blackbirds and Boat-tailed Grackles react similarly in their feeding areas. Stoddard and Handley seldom found individual Chimney Swifts returning to the chimney in which they had been collected, and Dr. A. K. Fisher relates that some years ago a little persecution of English Sparrows at Governor Pinchot's home in Milford, Pa., resulted in the birds abandoning the ivy covered walls throughout ensuing years although the barns a few hundred yards distant still harbored them.

The only thoughts I have to offer on such experiences are the following: There seems to be no dearth of roosting facilities that are acceptable to the birds. Neither are there any inseparable ties or affinities to draw birds back to a roost once it has been definitely vacated and the birds established elsewhere. As I look back, however, over many varied experiences with bird roosts I am unable to explain why, on some occasions the most energetic and persistent efforts at roost eradication fail miserably and on others, little more than a suggestion to move meets with a favorable response. The uncanny ability to detect conditions that spell real danger, especially on the part of Starlings, blackbirds, and Crows, is to me another unexplained trait that often comes to light in problems of economic ornithology. However often it occurs and to whatever extent it may frustrate or alter well laid plans for control, I never fail to marvel at it. After

all it is such non-predictable reactions as these that add so much to the interest of economic ornithology and convince us that however exact our scientific findings may be we can not expect the actions of living birds to conform to formulae.

U. S. Biological Survey,
Washington, D. C.

CURVATURE OF WING AND FLAPPING FLIGHT

BY WILLIAM BREWSTER TABER, JR.

In the last issue of the Wilson Bulletin (XLIV, 1932, pp. 19-22) my paper on "Curvature of Wing and Soaring Flight" gives in detail the explanation of the effect of the curvature of the wing and how the air currents striking the under wing surface are deflected, thus causing an upward lift and a thrust forward, in this way supplying the necessary power for soaring flight. In making this explanation clear it was necessary to resort to a velocity diagram involving technical terms. So as to avoid repetition here I will ask the interested reader to acquaint himself with the technical terms and their meanings as given in this previous paper.

In figure 17, upper diagram, I have represented by the heavy curved line *CD* the cross section of a wing of a bird flying to the left in a horizontal direction as indicated by the arrow above the diagram. We will consider in this case that the bird is flying in motionless air and that the wing is flapping straight downward. By bringing the wing straight downward the same effect is produced upon the wing as if the wing were held motionless and an air current were blowing straight upward against it. (Here let me say that to understand this problem it is essential to keep constantly in mind that the velocity lines represent the directions and velocities of air currents *in relation to the wing*, and not to the body or any other part of the bird or to an observer standing on the ground). The line *BC* represents this upward air current, the arrow on the line showing the direction, and the length of the line representing the velocity of this air current. Since the bird is flying horizontally to the left, the line *AB* has been drawn representing the current of air passing by the wing to the right. The resultant of the two components *AB* and *BC* is *AC*. In other words, the combined effects upon the wing of the two air currents, *AB* due to the motion of the bird to the left, and *BC* due to the motion of the wing downward, is equivalent to a single current blowing upon the wing in the direction *AC* and of a velocity proportional to the

length of *AC*. In an ideal case this air current will just slide in under the front edge, swing around along the under surface of the wing and come off at the back edge in a direction tangential to the wing at *D* as shown by the line *DF*. As this is an ideal case loss of energy due to friction or eddying need not be considered, hence I have drawn *DF* exactly the same length as *AC*. The vertical component of *DF* is *DE*. Hence the total lifting effect upon the bird wing is proportional to the length of *BC* plus *DE*. Now it can readily be seen that *EF* is longer than *AB*. Since *EF* is longer than *AB*, or in other words since the horizontal velocity of the air current coming off the back edge of the wing is greater than the horizontal velocity of the air current coming in under the front edge of the wing there is a thrust forward, and the thrust forward is proportional to the difference in length of *EF* and *AB*. Consequently by bringing the wing sharply downward the bird produces a combination of air currents which, since they are deflected by the curved under surface of the wing, produce an upward lift which is opposed to the force of gravity, and a forward thrust which tends to move the bird forward. Whether or not successful flight is accomplished depends upon a number of other conditions such as the position of wing in relation to the various actual air currents, area of wing surface, weight, and other numerous factors.

No doubt by this time the reader has noticed that I have used a similar diagram and given a similar explanation in this paper on flapping flight to that which I did on soaring flight. It can readily be seen that this is perfectly justifiable, for in soaring flight when the wings are held motionless the bird is dependent upon upward moving air currents, while in flapping flight the bird obtains the same effect by bringing its wings sharply downward.

The Advantage of the Forward Downward Wing Stroke. It is common knowledge that birds in ordinary flapping flight not only bring their wings downward, but at the same time swing them forward. This may be easily observed by watching the slow flapping flight of any birds as large as, or larger than, the Crow. The rapidity of wing beat of smaller birds makes this observation upon them very difficult, or impossible, to the unaided eye. It is a fact that the effectiveness of the wing beat is greatly increased by this forward downward motion. I will, therefore, devote the remainder of this paper to explaining how this is.

We will now consider that the bird is flying under the same conditions as were given in the first part of this article, that is, to the left and in a horizontal direction and in still air, but with a forward down-

ward wing stroke rather than with a straight downward wing stroke. In figure 17, lower diagram, *ACB* has been drawn exactly the same as in the upper diagram. The line *BC* represents the velocity of the air current acting on the wing caused by a straight downward wing beat. Line *AB* represents the velocity of the air current acting on the wing caused by the horizontal motion of the bird to the left. While *AC* is the resultant of these two. Now, in the upper diagram, anything that increases the resultant *AC* will also increase *DF* and hence will increase the vertical component *DE* and the horizontal component *EF*. If this increase is accomplished, since *DE* represents the vertical velocity of the air current coming off the back edge of the wing, the

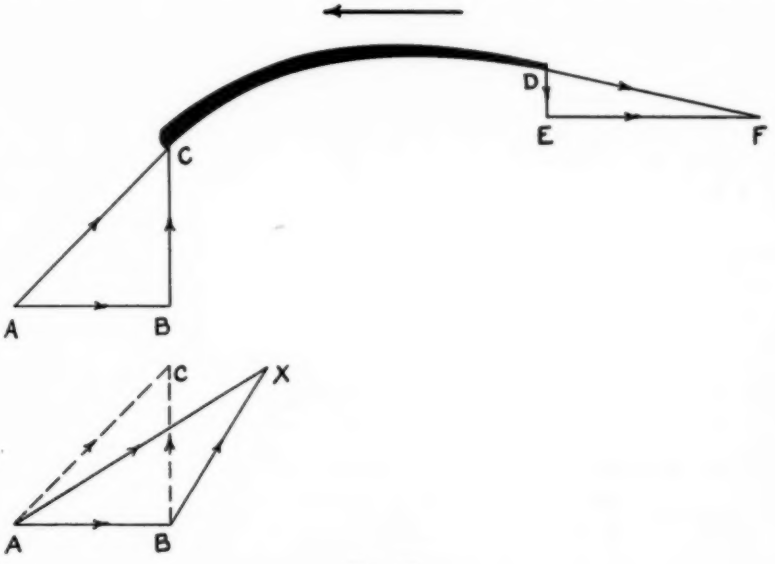

Fig. 17.

upward lift caused by the wing beat will be increased. Likewise since *EF* represents the horizontal velocity of the current of air coming off the back edge of the wing, the forward thrust will be increased.

Now the question is, will the forward downward wing beat increase the resultant *AC* and thus bring about all the attendant effects outlined above. In the lower diagram if, instead of drawing the component *BC* straight up as it would have to be in the case of a straight downward wing beat, we draw the corresponding component *BX* in the direction as shown, as it would have to be if the wing beat were forward and downward in the direction from *X* to *B*, then the resultant would be *AX*. It can be seen at a glance that *AX* is much longer than

AC, and therefore the resultant air current velocity would be much greater than in the case of the straight downward wing beat. Since with the forward downward wing beat the air would slip under the front edge of the wing with greater velocity it would also come off the back edge with greater velocity. So the downward horizontal and velocity components would be proportionately increased, and hence the lift upward and thrust forward would be increased.

This explains why the forward downward wing stroke is so much more effective than the straight downward wing stroke, and hence is the wing motion usually employed in flapping flight.

Greenwood Farm, Kansas, Illinois.

HARLAN'S HAWK*

BY NORMAN A. WOOD

Harlan's Hawk (*Buteo borealis harlani* (Audubon)) has interested me for many years past, but more so since I received my first specimen, taken May 1, 1916, in northeastern North Dakota by H. V. Williams, who has since that time sent me fifty more from the Red River Valley. From a small area in northwestern Arkansas I have added eighty more, and seven others from different states, or 137 in all. The last mentioned eighty-seven of these birds are all from the winter home of the species, and thirty birds have reached me in the flesh. These I have weighed and measured, and have made photographs of a few, showing the "peculiar" and "characteristic" markings of this fine bird.

Several years ago I noticed the plate of Harlan's Hawk by Audubon, and compared the figures with his description in the Ornithological Biography, 1831, pp. 442 and 443. He described an adult male (Birds of America, Pl. 86, Fig. 1) as having the tail "rather narrowly barred with brownish black." None of our adult birds have barred tails, so I agree with Taverner[1] that this bird was an immature one, probably a redtail. Audubon does not describe the adult female (Fig. 2 on same plate) but says that it resembles the male and measures twenty-two inches, which is about the same as twenty-two females measured by me in the flesh. I have examined Plate 86 carefully and find neither male nor female in adult plumage. I believe both are melanistic redtails. Both have the tails barred and both are entirely without white spots. Certainly neither one is the type as described by Sharpe. (In the British Catalogue of Birds, Vol. 1, 1874, p. 191).

*Read at the Detroit meeting, 1931, of the American Ornithologists' Union.

[1]Bulletin 48, Victoria Memorial Museum, p. 10. Ottawa, 1927.

FIG. 18. An adult male melanistic Red-tailed Hawk from northwestern Arkansas. January 14, 1929.

FIG. 19. An adult male melanistic Red-tailed Hawk from northwestern Arkansas. January 14, 1929. This is the under surface of the specimen shown above (Fig. 18).

No sex is given, but by the measurements and description it is a female Harlan's Hawk (not Fig. 2, as painted by Audubon, however). This type specimen described by Sharpe is very like several in our collection. Mr. J. H. Fleming has written me that he has examined this type in the British Museum, and that it is no doubt a (so-called) Harlan's Hawk.

We must therefore accept Taverner's theory of a mistake or accident in the history of the British specimen, but I, for one, can not accept his theory that *harlani* and *calurus* are the same. He regards *harlani* as a melanistic redtail. Now, in our Museum collection we have twenty birds in this phase of plumage ranging from pure brownish black to a mixture of reddish black, but all have no white in the plumage except at base of feathers on head and nape (Fig. 18 and 19), while *harlani* has white spots both above and below, often from bill to feet (Fig. 20). In melanistic redtails, the adult birds have the red (more or less) barred tail, while adult Harlan's Hawks have the tail streaked and spotted (Fig. 21), never red barred. Immature Harlan's Hawks with barred tails have usually the same black and white spotted plumage (Fig. 22), in strong contrast to the brownish black of immature redtails. Ridgway (Ornithology of Illinois, 1889, pp. 469-471) gives the best description of Harlan's Hawk I have found, both light and dark phases. Of the tails of immature birds he says, "The black bars are wider and decidedly zigzag and oblique."[2] An immature female taken January 25, 1931, in northwestern Arkansas, has two new outside rectrices on one side and three on the other, while the balance are barred with the wavy or U-shaped black bars characteristic of immature Harlan's Hawks (Fig. 23). There are others also in the collection that show this change of tail coloration from immature to adult. In handling these birds in the flesh I noticed a great difference in the markings of the under side of the wings. Harlan's Hawks are more extensively mottled and streaked than redtails. This is also true of the axillaries, which in *harlani* are blackish, while in redtails they are brown (Fig. 24). Figure 25 is a Western Red-tailed Hawk. Figure 26 is a typical adult male of *harlani* taken in northwestern Arkansas on February 26, 1929.

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[2]Ridgway says, "Plumage of flanks, tibia, and crissum remarkably lengthened and lax, the latter reaching within two inches of the tip of tail, and the tibial plumes reaching to the base of the toes."

I find these characters very constant in most of our specimens.

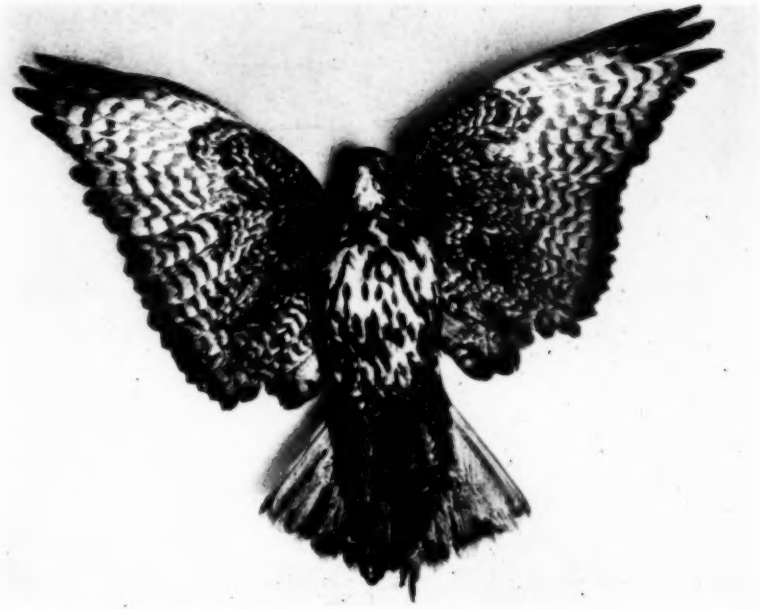

FIG. 20. An adult male Harlan's Hawk taken in southwestern Missouri, January 22, 1929. Ventral aspect.

FIG. 21. Upper surface of the tail of an adult male Harlan's Hawk, taken in northwestern Arkansas, January 1, 1929.

FIG. 22. Immature female Harlan's Hawk taken in Benton County, Arkansas, January 18, 1929. Ventral aspect.

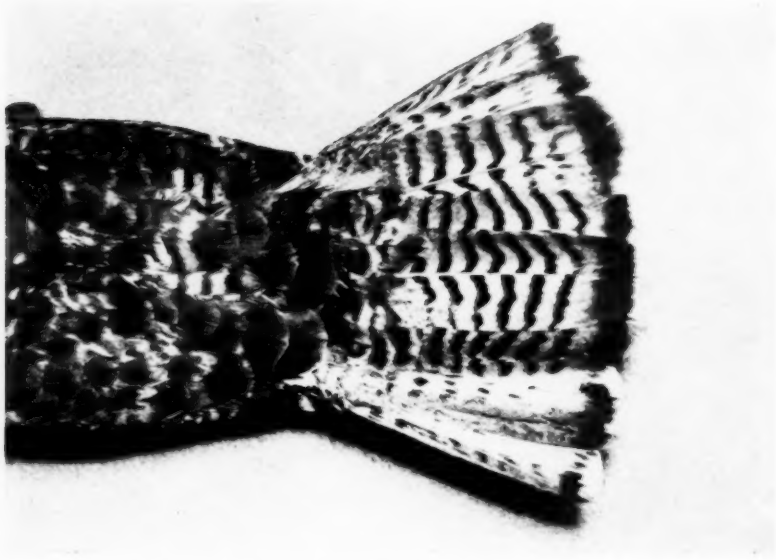

FIG. 23. Upper surface of the tail of an immature female Harlan's Hawk taken at Pea Ridge, Arkansas, January 25, 1931.

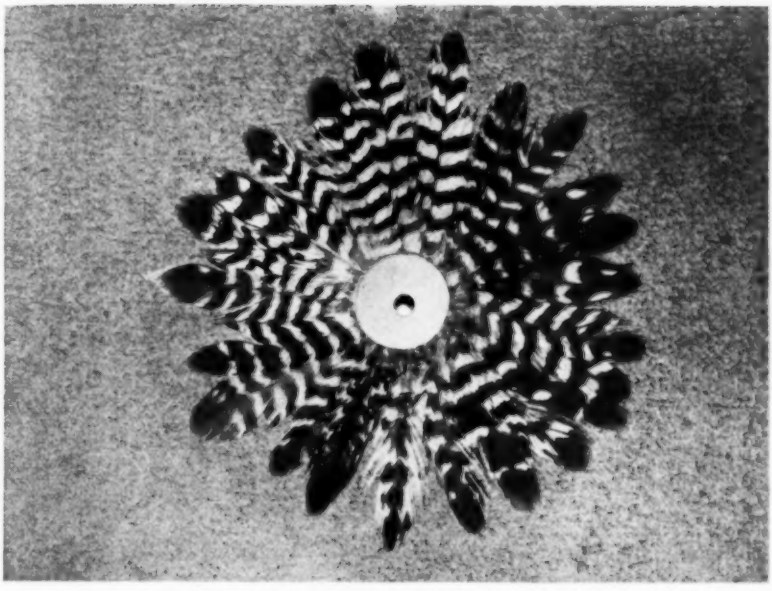

FIG. 24. Axillaries of Harlan's Hawk.

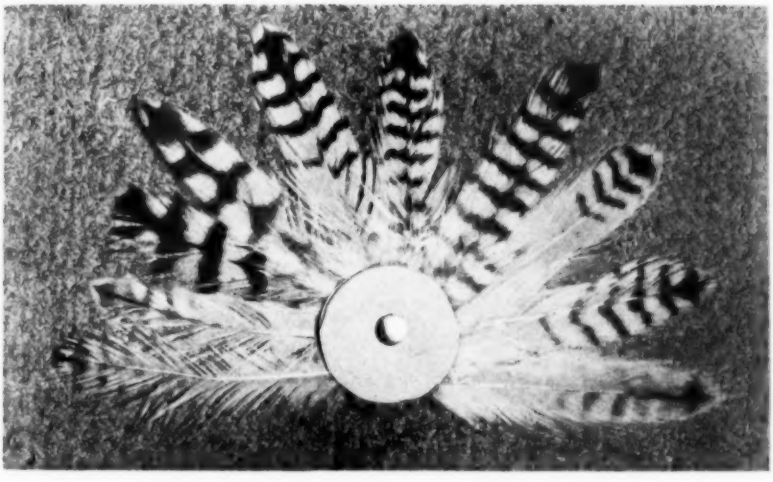

FIG. 25. Axillaries of the Western Red-tailed Hawk.

TABLE I. COMPARATIVE WEIGHTS AND MEASUREMENTS

	Harlani		*Borealis*		Difference
	No. spec.	Lbs.	No. spec.	Lbs.	
Average weight of female hawks	10	3.25	7	2.75	8 oz.
Average weight of male hawks	17	2 25	11	2.00	4 oz.
		Inches		Inches	
Average length female hawks	10	22.50	7	22.00	.5 in.
Average length male hawks	14	20.75	5	20.50	.25 in.
Average length female wings	36	16.25	61	15.75	.5 in.
Average length male wings	28	15.50	29	14.75	.75 in.
Average length female tails	37	9.75	61	9.00	.75 in.
Average length male tails	48	9.25	29	9.00	.25 in.
Average length female tarsus	30	3.38	49	3.42	.04 in.
Average length male tarsus	60	3.37	57	3.45	.08 in.

The measurements of length are all from birds in the flesh, all from birds taken in winter quarters, and all from birds in good condition—some of them being fat. Harlan's Hawk is somewhat larger and heavier than the redtail.

Harlan's Hawk has a light phase; at least, we have seven in our collection that have much the same pattern of coloration as some redtails, but the markings are black and the tails of all adults (6) are mottled and streaked, in fact typical *harlani* in that respect. Ridgway (Birds of Illinois, 1889, p. 469) describes this phase, and Taverner (*Op. cit.*, Pl. III, Fig. 6) shows a typical photograph of this phase. Figure 8 of his same plate is drawn from Audubon's plate of the "Black Warrior or Harlan's", as described. As I have mentioned before, this bird is a pure immature melanistic redtail. Prof. G. Eifrig (WILSON BULLETIN, Vol. XL, No. 4, 1928, pp. 216-218) has an article "On the Status of Harlan's Hawk". He gives several reasons for the belief that Harlan's Hawk is a distinct subspecies. However, his reasons were based on a very small number of specimens, and some of them will not hold. He says, first, there is much more white in the plumage of Harlan's Hawk than in the redtail. Yes, this is one of its chief characters. Second, he says there is no brown on breast and belly in *harlani;* this does not hold for all specimens. Third, he says there is an utter lack of barring on the tibial feathers in *harlani.* In fact in nearly all of Harlan's Hawks the tibia is spotted or barred, often with reddish brown. Fourth, he says the tail of *harlani* is decidedly different from that of *calurus.* This I believe is the chief distinguishing character. In adult of Harlan's Hawk the tail is spotted and streaked, but never red-barred. However, there is quite a variation in the color of the tail, more even than in the body color.

Its winter range includes a territory embracing all of Arkansas, southern Missouri, Oklahoma, and northern Texas, according to Mr.

D. R. Gipple, one of our collectors, who says, "I trap these birds on the ground, using opossum and rabbit for bait, and I see an average of from five to seven a day from the last of October to the middle of April. They seem to feed mostly on rabbits and quail and more or less on the smaller birds of all kinds." Mr. Clyde Day, our other collector, says, "These hawks seem to make their winter quarters in a strip about 100 miles north and south and 300 miles east and west. I see on an average ten a day, half of them Harlan's." Both men say

FIG. 26. Adult male Harlan's Hawk taken in northwestern Arkansas, February 26, 1929. Ventral aspect.

they have never seen a Harlan's Hawk nesting in that region, but many redtails nest there. Mr. H. V. Williams, of Grafton, northeastern North Dakota, who has collected in that region for many years, says he has never seen Harlan's Hawk except during their migration north in April and May (dates April 3 to May 6), and the migration south in September, October, and November (dates, September 28 to November 20). He says, "They are a decidedly larger and heavier bird (very noticeable in the flesh) and the general markings are different." Mr. Williams has collected fifty or more of these birds and is in a position to know them well. He says the flight usually starts with a few stragglers, and gradually increases to its height (about 200 birds

for a day or so), then gradually decreases. He says, "I see usually from 700 to 1000 every spring and fall. They fly with the redtails and circle the same way, usually very high, but after the first few days a number of them stop to feed, but are very shy and wild." We have a specimen from Cherry County, northern Nebraska, November 12, 1925; and a specimen from Hamilton, in southeastern Kansas, November 22, 1924.

Swarth[3] says, "Breeds in extreme northern Bristish Columbia, east of the coast ranges, north into the valley of the Yukon, and eastward for an undetermined distance, migrates southward east of the Rocky Mountains, through the Mississippi Valley, to a winter home in the Gulf states." In fact its normal winter range is well to the north of the gulf region. There are few records east of the Mississippi River. On April 12, 1893, Mr. Albert Lano collected a female near Madison, Minnesota, near the Red River (*Auk*, XIII, p. 342). Robert Ridgway records "a fine adult male of this rare species. It was taken by Mr. Chas. K. Worthen near Warsaw, Hancock County, in March, 1879," (Ornithology of Illinois, Part I, p. 472). F. Woodruff records "one shot near Calumet Lake, Chicago, October 1, 1895," (Birds of the Chicago Area, 1907, p. 95). In "Birds of Indiana", A. M. Butler, in the Report of the State Geologist for 1897, p. 784, says, "accidental visitor. Mr. R. B. Williams, Lebanon, Indiana, has a fine specimen of this hawk, shot in September, 1887, in Boone County, Indiana. This is the first record of the black hawk from Indiana. The well-known Indian chief, Black Hawk, was probably named after this bird." Taverner quotes Dr. L. B. Bishop, who says, "I collected a fine old male *krideri?* in worn breeding plumage, but with a fresh *harlani* tail, near Rolla, North Dakota, July 24, 1901." This might possibly have been a breeding bird, as this is only twenty miles south of the U. S. boundary line. Swarth, 1926, p. 108, says, "I cannot find, though, that there are definite published accounts of the breeding of *harlani* in any region whatever." He overlooked the account of Charles R. Keyes in *The Warbler*, Vol. III, 1907, pp. 41-45, who described the breeding of Harlan's Hawk in Iowa County, Iowa, near Amana. A pair of the birds nested in the same woods for five years in succession, and the first set of eggs was taken April 21, 1898; then Set No. 2 on April 24, 1899; Set No. 3, April 9, 1900; Set No. 4, March 29, 1901; and Set No. 5 on April 10, 1902, from the same tree and nest as Set No. 1. Photographs of three of the sets accompany this paper. Three of

[3]Report on a collection of birds and mammals from the Atlin region, northern British Columbia. Univ. Calif. Publ. Zool., Vol. 30, No. 4, 1926, pp. 51-162.

these sets were in the John Lewis Childs collection. He says the nests were placed from thirty to thirty-two feet above ground, and "it will be seen from the above that the nidification of Harlan's Hawk differs quite naturally from the typical instances of the Red-tailed Hawk, the nest being placed at so low an elevation and without the commanding view . . . the latter species prefers. The eggs, too, are readily distinguishable from a typical series of Red-tails." Later one of these hawks was shot at the nest and was identified by Mr. Brown as "Harlan's Hawk in the melanistic phase of plumage." This is the most southern locality from which this species has been recorded as breeding, and while it was possibly Harlan's, it may have been only a melanistic redtail.

Swarth (1926, p. 110) says, "The most I can claim for the facts here adduced is that they are corroborative of the idea of *Buteo b. harlani* being a geographic race rather than a color phase," while my work on these birds tends to show that color is one of the constant and chief differences between it and the redtails.

My study of this species was finished in the winter of 1931, and this paper was written at this time. The result of my study convinced me that "*harlani*" was entitled to a specific place in the check-list and when "The Check List of the Birds of the World" came out I was glad to see that Peters had arrived at the same conclusion and had given the species its proper name and place.

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Ann Arbor, Michigan.

SNAKES VERSUS BIRDS; BIRDS VERSUS SNAKES

BY J. E. GUTHRIE

"But when I found myself on the ground, I speedily untied the knot, and had scarcely done so, when the roc, having taken up a serpent of a monstrous length in her bill, flew away. I could not view without terror a great number of serpents, so monstrous that the least of them was capable of swallowing an elephant. They retired in the daytime to their dens, where they hid themselves from the roc, their enemy, and came out only in the night." From The Second Voyage of Sindbad, "Arabian Nights". Ingersoll (65, p. 200).

"Between the eagle and the dragon there is constant enmity, the eagle seeking to kill it, and the dragon breaks all the eagles' eggs it can find; and hearing the noise of the eagle in the air, speedeth to its den, and there hides himself." Cruden's Concordance, 1737 (p. 152).

"By them there sat the loving pellican
Whose young ones poisoned by the serpent's sting,
With her own blood again to life doth bring."

Noah's Flood. Michael Drayton in "Birds in Legend, Fable and Folklore" (65, p. 59).

Quoting further from Ingersoll (65, p. 24): "Whatever tradition or superstition or other motive affected the choice of a bird as a tribal totem, or endowed it with sacredness, practical considerations were surely influential. It is noticeable that the venerated ibis and hawk in Egypt were useful to the people as devourers of vermin—young crocodiles, poisonous snakes, grain-eating mice, and so forth. A tradition in the Aegean island Tenos is that Poseidon, a Greek St. Patrick, sent storks to clear the island of snakes, which originally were numerous there. Australian frontiersmen preserve the big kingfisher dubbed laughing-jackass for the same good reason."

Ingersoll (65, p. 39) recounts how "the Aztecs moved into the valley of Mexico and settled upon certain islets in a marshy lake—the site of the subsequent City of Mexico; and this safe site is said to have been pointed out to them by a sign from their gods—an eagle perched upon a prickly-pear cactus, the nopal, in the act of strangling a serpent. Cortez engraved it upon his Great Seal, and Mexico has kept it to this day."

Someone has said: "A bird is but a glorified reptile", and the Mayas of Yucatan guarded their great temple with stone statues of feather-decked rattlesnakes representing their deity Huitzilopochtli or Kukulcan—surely a glorified reptile!

Naturally, the main relation between birds and snakes is a food-relation. Snakes are meat and birds are meat. Snakes are carnivorous and so are many birds, very few birds being entirely vegetarian. Some snakes eat eggs and so do some birds. Some snakes and some birds compete among themselves and with each other for items in the same food supply. If the heron spears the frog, the water snake goes hungry; if the bull snake seizes the mouse, the hawk dines elsewhere. The garter snake dozes away the morning, digesting his supper of earthworms while the early bird hunts just that much harder for a cropful. Mrs. Mary L. Bailey (6, p. 221) even witnessed a spirited battle between an American Bittern and a snake, judged to be a garter snake, for the possession of a frog which both had seized. The bird got the lunch. And we may go even deeper; for the mouse that would have eaten the weed seeds is the prey of a milk snake, and the Song Sparrow converts those very seeds into songs. It might make life interesting to a cricket to speculate whether a young blue racer will seize him, or whether he will be stuffed down the hunger-well of a nestling meadowlark. Moreover, sometimes the scaly and the feathery beings have common enemies. A garter snake, a chickadee, a mouse and a grasshopper might easily find themselves close neighbors—centrally located in a henhawk.

Before going more specifically into these food relations, let us look at a touching instance of devotion, in which the serpent even gives the coat off his back for the comfort of the others' bairns. It is *Myriarchus crinitus boreus*, of course, that "Wild Irishman of the fly-catchers" as the Sage of Slabsides called the Northern Crested Fly-catcher, who is the best known "ol'-clo'es man"—he and some cousins of his. Alexander Wilson (120, Vol. 2, p. 134) says: "Snake skins with this bird appear to be an indispensable article, for I have never yet found one of his nests without this material forming a part of it. Whether he surrounds his nest thus by way of *terrorem*, to prevent other birds or animals from entering, or whether he finds its silky softness suitable for his young is uncertain; the fact however is notorious." In speaking of the several species of birds which bed themselves with snake sloughs, Finn (41, p. 113) says: "All of the birds with this liking for snakes' old clothes breed in holes, and it has been suggested that the slough is used to terrify intrusive lizards, which are no friends to eggs and young birds, and are themselves preyed upon by snakes." Strecker (111, p. 506) apparently disproves this supposition by listing among fourteen snake-skin users, eight which nest in holes, one which usually does and five which do not. Dugmore (38,

p. 106) remarks of the same bird's home: "Nest in a hollow in a tree, it is rather bulky composed of grasses, weeds, feathers, and frequently castoff snake skins." Davie (34, p. 241) speaks of the nest of the Arizona Crested Flycatcher, *Myiarchus tyrannulus magister*, as being "entirely similar to that of *M. crinitus* even to the traditional snake skins." Of the Mexican Crested Flycatcher, *Myiarchus tyrannulus nelsoni*: "With one exception no snake skins were used in the construction of any of the nests." Also noted by Merrill (81, pp. 118-173). According to Chapman (27, p. 124) Lieut. Wirt Robinson has discovered that one of the commonest and most generally distributed species of the genus in South America places cast snake-skins in its nest. The habit is therefore widespread and is common to birds living under greatly varying conditions. Myers (85, p. 78), describing nest linings of *Myiarchus cinerascens cinerascens*, comments: "Occasionally snake skins, but these are not so frequently used as by the eastern birds." Strecker (111, pp. 501-507) has collected written records and has observed widely concerning this use of cast snake skins. He mentions, besides the flycatchers already referred to, the Eastern and Western Blue Grosbeaks, *Guiraca caerulea caerulea* and *Guiraca caerulea interfusa*, the Gray-tailed Cardinal, *Richmondena cardinalis canicauda*, a single instance of the English Sparrow, *Passer domesticus domesticus*, and four instances of the Carolina Wren, *Thryothorus ludovicianus*. One of these, Abbott (1, p. 158), was in New Jersey. Of the Black-crested Titmouse he says: "A description of the nest of this species would be incomplete without mention of the 'casts'." The road-runner, *Geococcyx californianus*, shows also this habit according to Jaeger (66, p. 13) and Bailey (5). Hume (61, p. 72), mentioned also by Strecker, mentions the Bank Mynah, *Acridotheres gingianus*, as using "feathers, grass and scraps of snake skins." Hume (61, pp. 77-79) also remarks the same habit in the two robins of India, viz., the Brown-backed Indian Robin, *Thamnobia cambaiensis*, and the Black-backed Indian Robin, *Thamnobia fulicata*. Whitaker (119, p. 74) finds the Rufous Warbler building snake skins into its home. And now, if only snakes would build themselves nests of birds' feathers! Snakes have been found in hens' nests, of course, which is not surprising when one considers how fond a serpent is of that warmth which Mother Nature has denied it in its own right. A considerable number of instances have come to our attention in newspaper clippings and otherwise. In one case, Tessman (newspaper item), it was a rattlesnake, and the hen was dead when found, the assassin coiled beneath her body. A parallel case is on record, Cameron (26, p. 383), of a

viper found in the nest of a Buzzard, *Buteo vulgaris*. In this instance, noted from Pomerania, the living viper was found beneath the dead body of the female Buzzard. Sometimes it has been bull snakes or other snakes which may have come because they were egg-hungry.

Snakes Eat Birds

In dealing with the direct food relations between these two classes of animals we shall first consider snakes as the eaters. Some birds and some snakes consume eggs. All birds and some snakes lay them. Advantage goes to the snake, however, for her eggs are usually better concealed. To offset this, the caciques, icterine birds allied to the orioles, weave pendant nests a yard long, apparently to ensure safety from monkeys and snakes. An instance is recorded by Blanchard (18, p. 48) in which a captive milk snake ate even the eggs of a ring-neck snake. Two tropical, egg-eating snakes are so specialized for this egg diet that ventrally projecting blades from the neck vertebrae slit the shells of birds' eggs that are being swallowed. Did the man who invented the band-cutter on the threshing machine know about this, we wonder! In Boulenger's Fauna of British India (22, p. 393) we read concerning the genus *Elachistodon*: "As in the African genus *Dasypeltis*, each of the anterior vertebrae has the hypapophysis or inferior process much elongate, toothlike, capped with enamel and penetrating the walls of the oesophagus." It has been observed that the African snakes feed on eggs, (Wood, 122, III, p. 135) "which are broken in passing along this series of processes, and having arrived so far down the gullet that the mouth can be closed, none of the contents are lost. The same is doubtless the case with *Elachistodon*."

The process of engulfing an egg is an interesting one to watch, whether it is by a milk snake or young bull snake swallowing a sparrow's egg, or a full-grown pilot blacksnake taking down a hen's egg. The egg is approached, touched delicately with the tips of the exquisitely sensitive tongue, and the diner is satisfied that it is desirable food. (How can a young snake know what is going to be inside his first egg? Ask Nature!). The snake now often moves about, stretches its jaws, does various things before actually beginning the swallowing process. Why? Perhaps its imagination is setting its salivary glands at work secreting the large amount of saliva necessary as a lubricant. The snake does not lick over its prey—egg, bird, or mouse—to make it slippery before beginning its meal. An egg is a difficult object to get into the mouth; it is so big, round and smooth, and so hard. John Cole, of Wisconsin, told the writer that his father had known a bull snake in Iowa to visit a turkey's nest daily and swallow the freshly

laid egg. The jaws are pushed over it as the egg is pressed against some convenient object or even against the snake's own coils. Advancing right and left sides alternately its jaws literally crawl over the mouthful. When it is past the head, the muscles of the neck contract and pull it down. After passing down perhaps a foot (in a five-foot snake), the muscles are powerfully tightened and the rough lower ridges of the vertebrae brought to bear on the egg so that the shell gives way. Some snakes are said to swallow the egg whole all the way down and to rely on the digestive juices to dissolve the shell in the stomach. Snakes are sometimes over-eager nest robbers, as witness the note by Holt (58) describing the swallowing of a stone nest egg by a pilot snake, *Elaphe obsoleta*. Another snake, a bull snake, is also referred to by Trine (117, p. 4) as having swallowed a glass one. Several episodes are reported of the persistence of snakes after they had once located a nest of eggs. Northup (in 86, p. 330) drove a blue racer out of a bush in which it was caught in the act of taking an egg from the nest of a Red-winged Blackbird. Thirty minutes later the bird's cries of distress drew the observer back to the nest where he again found the racer. Seiler (103, p. 189) discovered a large bull snake which was climbing the tree containing a wren's nest. She frightened the intruder away. It soon returned and was found with its head inside the entrance of the wren house. One more such instance: Spencer (106, pp. 108-110) records the attack of a black racer on a Catbird's nest in a huckleberry bush. Having eaten all but two of the young birds, it was driven away but was soon back for another, and a little later returned for the last survivor. This observer also found that the eggs of a Bob-white, placed under a hen for hatching, were disappearing, with a great commotion by the foster-mother every time one was taken. When the last one disappeared he saw a great black snake gliding off through the grass.

Some species of snakes confine themselves to cold-blooded prey. Ditmars (37, p. 249) says: "Water snakes do not eat birds," and of garter snakes, Ditmars (36, p. 246): "Adult garter snakes feed principally upon frogs, toads, and earthworms—never upon warm-blooded prey." This statement agrees with the experience of the writer, Guthrie (55, p. 186), who has had scores of garter snakes in captivity and has yet to see one consume or even kill a bird or mouse, or eat a bird's egg. Esther E. Gilmore (52) working at the University of Michigan Biological Station in 1930 tried repeatedly to get garter snakes to eat living and dead birds and birds' eggs. The only success she had was in using a kinglet with wings and tail clipped off. A

garter snake, *Thamnophis sirtalis*, was finally induced to swallow it.

Garter snakes do eat birds occasionally, however, for we have the word of several good observers on this point. Gabrielson (48, p. 137) saw a garter snake swallow the last of nine eggs in a Bobolink's nest in Iowa. Ruthven (97, p. 13) says of garter snakes, genus *Thamnophis*: "On the dryer uplands they have been observed to eat . . . fledgling birds. While in captivity it seems to be impossible to get them to eat dead food, but in the wild state specimens of three species (*sirtalis, radix, elegans*) have been observed to eat . . . birds that had been dead for a considerable time." The writer has had several garter snakes in captivity that came after a time to accept dead frogs or pieces of any kind of meat. Branson (23, p. 377) mentions a case where a western hognose snake, *Heterodon nasicus*, ate a dead Western Meadowlark. Some snakes such as the grass snake, *Liopeltis vernalis*, the red-bellied snake, *Storeria occipito-maculata*, and De Kay's snake, *Storeria dekayi*, as well as the tiny worm-snakes of the genus *Carphophis* are too small to eat birds, even if they cared for warm-blooded prey.

Of the bull snake, *Pituophis*, Ditmars (37, p. 319) says it "is particularly fond of eggs, and consumes them entire, breaking the shells in the throat by a contraction of the muscles. The writer witnessed an illustration of the voracity of one of these creatures. It swallowed fourteen hens' eggs, breaking the shell of each after the egg had passed about a foot down the throat. The demonstration closed by the supply of eggs becoming exhausted and not from any indifference on the reptile's part." Many large bull snakes in the author's cages could not be induced to eat hen's eggs at all, and others only occasionally.

As to the eating of birds by snakes, probably any snake that eats eggs will as readily eat the young birds, or even the old birds if of the proper size, and if it can catch them. The young are helpless and cannot escape, but the parents usually do unless surprised on the nest, bird-charming stories to the contrary, notwithstanding. Of the food of the copperhead, Ditmars (37, p. 422) also writes: "Here these snakes find abundance of food in the shape of birds, small rodents, and frogs. During the late spring these snakes prefer young birds, showing in fact such a decided preference to this food that some snakes will fast unless provided with the feathered prey."

The ways in which snakes catch birds are varied and interesting. With helpless nestlings and eggs, of course, the maurauder usually has an easy time of it, as nests are often placed on the ground or in low

bushes. Van Denburgh writes (Blanchard 19, p. 78) of the Boyle's king snake, *Lampropeltis getulus boylii*: "I have twice found it swallowing the contents of quails' nests, and once observed one crawling along the ground, and looking up into the bushes for nests of small birds. Several times while I watched, its quick eyes detected nests three or four feet above it, but although the snake immediately climbed up to these, it did not obtain a meal, for the nests which it examined had been abandoned by their builders or robbed by some earlier comer." Director Edgar R. Harlan of the Iowa Historical Society Museum, told the writer that he once shot a pilot snake while it "was investigating a flicker's nest about sixty feet from the ground." Sometimes the parent birds become militant in defense of their homes. Dr. T. C. Stephens mentions (in correspondence) a case in which a female Brown Thrasher fought an intruding snake. Birds of other species than those molested frequently gather about an attacking snake and try to scold it to death. Results negative.

The usual method of capture is by a quick dart of the head—a snake's lunge is almost unbelievably swift—and the victim is seized by the nearest corner, head, body, leg, wing; the serpent sometimes getting only a mouthful of wing or tail feathers. The writer has observed that when a rattlesnake strikes a mouse or ground squirrel or rat it usually sinks its fangs with their charge of venom, then retreats to a little distance to await the victim's death. With an English Sparrow, however, the rattler seldom lets go after the stroke but holds on until the poison has done its work. As a snake could not follow its wounded prey by the air route it probably saves not a few meals by this habit. Of course the non-venomous bird-eaters retain their hold until the captured prey is either killed—in the case of such constrictors as the bull snake, fox snake, or pilot snake—or until it gets the living prey jockeyed around into swallowing position—in case of a racer or coach-whip. As to how the bird is approached or attracted near enough to be taken there seems to be some doubt. Probably such an inconspicuous object as a snake, fitting so well into the lines and colors of its surroundings, may often be accidentally approached by a hapless bird which does not realize the presence of the danger until too late. Probably, also, the noiseless reptile occasionally sneaks up successfully while its intended quarry is otherwise occupied. It is interesting to know that from the same Anglo-Saxon word *snican*, to creep, came the two words, snake and sneak.

The question of the occult influence which a snake's mind is popularly supposed to exert on the mind of the bird is a matter of spirited debate. Over a century ago, James E. DeKay observed (35, p. 57): "The absurd notion of fascination is entertained by few at the present day." Psychologists versed in the lore of mind, and knowing how much inferior is the reptile brain to that of its avian prey deny this power to the snake—and one cannot doubt that men who have observed snakes for half a life time and studied them understandingly, would be likely to be on the lookout for and would notice any evidence of this phenomenon. Such men almost universally express their disbelief in any such occurrence in nature. The writer has had many bird-eating snakes—rattlers, fox snakes, bull snakes, pilot snakes, whip-snakes, blacksnakes, blue racers, king snakes, and boas. He has seen a sparrow peck at a rattlesnake's nose and ride around on the coils of a writhing rattler or bull snake. There was usually no evidence of fear unless the snake lunged, and never a sign of that paralysis supposed to hold the victim immovable through the baleful glare of the serpent's eye. To be sure, not to have seen such a phenomenon does not prove its impossibility. In explanation of the happenings one often hears recounted one is inclined to think of a fear paralysis such as sometimes is said to hold a man when a locomotive or automobile bears suddenly down upon him. Perhaps, thus, fear is the explanation. Undoubtedly the frantic parents in defense of nest and young sometimes venture too close for safety. Possibly a pugnacious bird in attacking an intruder becomes foolhardy—and rues it. And so, in the face of many hard-to-explain accounts by observers who thus interpreted the things they observed, Mr. H. A. Surface in "The Serpents of Pennsylvania" (114, p. 120) observes: "It is popularly believed that snakes have the power to charm birds and the lower animals and even mankind, but with the most careful investigation, we can not find satisfactory evidences of the truth of this. It is true that some creatures, such as birds, and even some persons, become so terrified at suddenly seeing a snake that they act more or less helpless, but this is quite different from being charmed."

Max Morse in Batrachians and Reptiles of Ohio (84, p. 100) remarks: "So many superstitions are associated with these forms of animal life that it would be impossible to cover them in this paper, to say nothing of attempting to disprove them. As classic examples we may cite . . . the charming power of snakes. It is needless to say that all these are myths." In "the Poisonous Snakes of North America" (108, pp. 292-293) Dr. Leonard Stejneger reviews the evidence con-

cerning "charming" thus: "The popular belief in the power of the poisonous snake to 'charm' its victims into a state of helplessness is by no means exterminated. In spite of all that has been argued and explained against it there are people still who profess to have ocular proof of this power. Time and again it has been related by trustworthy observers how birds or small mammals have been seen to approach the coiled snake, drawn toward it as if by a magic spell they were unable to withstand, etc. There is evidently enough truth in the numberless observations of this nature to keep the scientist busy trying to evolve a theory by which to explain so much of the stories as appeared worthy of being admitted as facts." D. Humphreys Storer in Reptiles of Massachusetts (112, p. 234) writes of the rattlesnakes, *Crotalus*: "The power of fascination attributed to this genus is too absurd to require our serious consideration." Another authority on reptiles, E. D. Cope (29, pp. 713-714) explains thus: "Snakes are popularly believed to possess the power of 'charming' or attracting to themselves other animals, especially birds, against their will, so that they easily capture them for food. This belief rests on a habit which is usual among the smaller birds of annoying other animals which they dislike or fear. Every one knows how they will congregate about an owl which has not sufficiently concealed itself by daylight and will make their hostility known by cries and efforts to strike their enemy. I have witnessed a crowd of birds collected about a black snake, which displayed their hostility by many cries and movements, the snake the while eying them with an inactive interest. Should one of the birds venture too near, I strongly suspect that the snake would take advantage of the opportunity to secure a meal, but this I have not witnessed. I believe, however, that the stories of 'charming' are due to an observation of this not uncommon experience of the field naturalist." In his account of the Boomslange (tree-snake), *Bucephalus capensis*, Wood states (122, p. 136): "The Boomslange is generally found in trees, to which it resorts for the purpose of catching birds, upon which it delights to feed. The presence of a specimen in a tree is generally soon discovered by the birds of the neighborhood, who collect around it and fly to and fro, uttering the most piercing cries, until some one, more terror-stricken than the rest, actually scans its lips, and almost without resistance, becomes a meal for its enemy." Dr. S. Weir Mitchell (82, p.), who had unexcelled opportunities for observation, wrote of the way in which birds and small animals behaved fearlessly when introduced into a cage with rattlesnakes and often came to live intimately with them. He concluded: "These are the sole

facts which I have seen bearing any relation to the supposed fascinating faculty. They appear to me to lend no strength to the idea of its existence."

And Birds Devour Snakes

So far as the literature goes the writer has found no record of birds having consumed the eggs of snakes, though doubtless some of them would do so if they could find them. Some strange instances come to light occasionally in which the most unexpected of birds are snake-eaters. The writer has been told of hens killing and eating green snakes, *Liopeltis vernalis*, in Iowa, and Blatchley (20, p. 549) writes: "I saw a chicken running along the roadside with a squirming snake in its bill. After a sharp chase of the fowl through a rail fence and a blackberry patch, its prey was dropped and proved to be a fine specimen of Storer's snake, *Storeria occipitomaculata*." Crimmins (32, p. 46) says: "I have personally seen chickens kill and eat rattlesnakes." These were young Texas diamond-back rattlers about twelve inches long. Oddly enough, several observations show that Robins sometimes feed them to their nestlings. McIntosh (76, p. 152) found a Robin pecking a thirteen-inch garter snake. The snake was evidently nearly dead when the bird finally managed to pick it up and fly off about seventy-five feet to a post on which one of its young was seated. It tried to feed it to the baby, which, of course, was unable to handle the unwieldy morsel. The snake was dropped to the ground but was picked up later and another futile attempt made to feed it to the young bird. Marshall (80, p. 304) saw a Robin kill a ten-inch garter snake and carry it up into a tree. Being called away he did not see the snake eaten but it was gone when he returned. Friedmann (47, pp. 259-260) once put two young Cowbirds in a Robin's nest. The Robins accepted and reared them and on one occasion he noticed that one of the young Cowbirds had been fed a very young garter snake which it finally swallowed and digested. Mallard Ducks are reported to occasionally eat snakes, (McAtee 78, p. 113), while Hay (56, p. 527) says that turkeys and ducks eat garter snakes. Crimmins (32, p. 47) says chickens and muscovy ducks ate pieces of a young Texas diamond-back rattlesnake, *Crotalus atrox*.

However, these are apparently unusual cases. Some birds which are mainly meat-eaters as shrikes, hawks, herons and the like eat considerable numbers of the scaly prey. Note the name "serpent eagle" applied to members of the genus *Spilornis* in the East Indies and Africa. The harrier eagles, *Batastur*, are also called "serpent eagles" and several kites go by the name of "snake hawks". The shrikes or

butcher birds, besides their usual fare of insects, rodents, and birds have serpents occasionally on their menu. Ditmars (36, p. 274) narrates thus: "During a collecting trip a queer observation was made. A heavy rain had fallen the night before, enticing the burrowing snakes from their hiding places. Evidently the scarlet snakes, *Cemophora coccinea*, had been conspicuous objects during the early morning. On the ends of dead twigs and stems, right and left, were the weird souvenirs of the shrikes or butcher birds, consisting of partially-eaten bodies of snakes. The reptiles were securely fastened by forcing the tip of the twig into the body cavity like a finger into a glove. The shrike is a carnivorous bird, notorious in having eyes too big for its stomach. Its half-eaten prey is thus jauntily deserted."

One would consider venomous sea-snakes safe from attacks of birds, but sea captains of the Molucca and Sunda Straits told Dr. Ditmars (36, p. 289) of having seen albatrosses and frigate birds dragging these serpents from the waves and flying to the rigging of the ship to kill and devour them. South Africa has two animals commonly known as "ringhals". One is a cobra which eats birds and eggs, the other is the white-necked raven which often feeds on snakes. Even the bush kingfisher, *Halcyon*, of Africa, and the "laughing jackass", *Dacelo gigas*, kingfisher of Australia, are snakivorous. The latter, according to Wood (122, p. 170), "catches them by the tail and crushing their heads with its powerful beak . . ." Another observer, Lucas and LeSouef (74, p. 161), describes the execution somewhat differently: "Swooping down from his perch of observation, with his formidable beak the latter (Laughing Jackass) strikes the snake before his own feet reach the ground, breaks the back of the reptile, and so disables it. He will fly up with the snake in his mouth, and then let it drop from a height back to the ground, and repeat this treatment until the snake can be safely swallowed." The ground hornbill, *Bucorax cafer*, subsists partly upon these reptiles as does the ground cuckoo known as Road-runner or chaparral cock of our Pacific coast, renowned in popular belief as being a valiant slayer of rattlesnakes. Naturally, many raptorial birds such as hawks, owls, and buzzards find scaly prey to their taste. Of the wading birds, the Sandhill Crane, *Grus canadensis tabida*, the Great Blue Heron, *Ardea h. herodias*, and the American Bittern, *Botaurus lentiginosus*, are serpent eaters. Klauber (70, p. 13) observes: "Aside from man, the principal enemies of the rattle snakes in this county [San Diego County, California] are birds and other snakes. Eagles, hawks, and owls are sometimes seen carrying rattlers and other snakes in their talons." Blatchley

(20, p. 548) says: "I observed a sparrowhawk fly across a meadow bearing a wriggling snake in its talons. I stepped up behind the thorn tree in which it alighted and giving a sudden whoop caused it to drop its prey, which proved to be an example of *Eutainia* (*Thamnophis*) *sirtalis parietalis*, the red-barred garter snake." Quoting from Barbour (9, p. 28): "Our red-shouldered hawk seems to feed almost exclusively upon snakes, at least in Florida. That curious hawk, the Secretary-bird of South Africa, classified as *Serpentarius secretarius*, eats any and all snakes, as do some of the great heavy-billed storks and ibises which kill their prey with blows of their powerful beaks." W. P. Pycraft (95, p. 115) writes: "The Secretary-bird (*Serpentarius reptilivorus*) of South Africa, from its fondness for poisonous snakes, has during the last few years been rigidly protected by law. Standing nearly four feet in height and of powerful build, this remarkable bird —an aberrant member of the hawk tribe—displays no small skill and caution in attacking its venomous prey, shielding itself by means of the wings and kicking violently with both feet until its victim is vanquished." Sometimes it is said to fly high in the air and kill its prey by dropping it on the rocks. Saintleven (100), in speaking of rattlesnakes in southern Texas, recounts: "Wild turkeys show a great antipathy to them, and never fail to make a direct and persistent attack until the reptile is destroyed." Speaking of an instance which he had witnessed, he tells of watching a large flock of wild turkeys of which the gobblers were engaged in killing a large rattlesnake. "One after another would spring into the air in rapid succession and come down on the reptile which they struck a hard blow with one wing. . . . It is their custom to eat the snakes killed in that way."

Thus between birds and snakes the honors, or dishonors, appear to be rather equally divided. To some species of birds, and to other species at certain seasons, snakes, both venomous and non-venomous, are the preferred normal diet. Other birds of somewhat omnivorous habits so far as animal food goes, get an occasional serpent. A few, Robins for example, may classify small snakes as merely unusually active angleworms and therefore good baby-food.

And with snakes much the same situation exists. Some are inveterate nest yeggs, getting most of their living by this species of burglary. Others catch many birds, both nestling and adult. A few occasionally eat dead birds, even as Crows and buzzards prize a dead snake as highly as a living one.

For practical purposes, for the Middle West, the *Buteo* hawks, especially the Red-tailed Hawk, the Marsh Hawk, and probably to a lesser extent Crows, herons and bitterns are the birds which send a shudder down the sinuous backbones of small snakes. Yet even though these birds take toll of some of our most valuable snakes, their rodent-destroying habits place them safely in the column of our feathered farm friends. And as to our snakes, what shall we say? Probably the pilot blacksnake, an inveterate climber, destroys more birds than any other in its habitat. Branson (23, p. 388) believed this to be the case in Kansas. Bull snakes, fox snakes, and racers get some eggs and young birds, with occasionally an adult. All these snakes are extremely valuable as mousers, ratters, squirrelers, and gopherers; and the blue racer as an insect-eater as well, to be too hastily condemned and summarily executed *en masse* for being "bird-lovers". Our other snakes probably do too little harm to birds to even deserve dishonorable mention.

Following is a list of snake bird-eaters and bird snake-eaters, not at all exhaustive, but suggestive, gathered from what literature was accessible to the writer. A considerable number of the references were kindly suggested by T. C. Stephens.

Snakes Eaten by Birds

In the following list the scientific as well as the common names of both snakes and birds are given when known. Of course, in many cases the species was unknown to the observer, at least the name was not recorded. In other cases the statement found applies to a whole group: as "herons", "hawks", "birds", "birds' eggs", "garter snakes", "colubers", etc. In the numerous cases recorded merely as "reptiles", snakes and lizards or either one of them may have been meant, but they have not been included in this list. It is probable that any birds that would eat lizards would also eat snakes of suitable size; and that snakes which would eat one bird or egg would devour any other of like size if obtainable. Some of the records are of isolated cases, while others indicate a regular food habit. Moreover, some are records of captive specimens, others of observations in the wild; while many have been gained from stomach examinations of collected specimens. It is not always possible from the records to determine which of the above was the case.

Albatrosses eat sea snakes, Boulenger (21).

Water Turkey or Snake Bird, *Anhinga anhinga*, eats snakes, Audubon (4).

Florida Cormorant, *Phalacrocorax auritus floridanus*, ate a water snake, *Natrix*, Pearson (94).

Frigate birds eat sea snakes, Boulenger (21).

Large sea birds eat poisonous sea snakes, Ditmars (36, p. 289).

Mallard Duck, *Anas boschas*, eats small snakes, McAtee (77, p. 10); McAtee (78, p. 113). Rattlesnakes, Crimmins (32, p. 47).

Ducks eat garter snakes, Hay (56, p. 527). Eat *Thamnophis sirtalis*, De Kay (35, p. 45).

Crested Screamer or snake crane, *Chauna cristata*, (of Brazil) fond of snakes as food, McAtee (78).

White Ibis, *Guara alba*, eats snakes, mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).

Glossy Ibis, *Plegadis autumnalis*, eats snakes, mostly moccasins, Baynard (14).

Egyptian Ibis, foe to small snakes, Ingersoll (65, p. 17).

Wood Ibis, Jabiru, *Mycteria americana*, eats snakes, Netting (88, p. 28); Smith (105, p. 59).

Ibises eat snakes, Barbour (9, p. 28).

Storks eat snakes, Barbour (9); Netting (88). Eat ringed snake, *Tropidonotus natrix*, Schmeil (102, p. 240).

American Bittern, *Botaurus lentiginosus*, eats snakes, Barrows (11, p. 128); Howell (59, p. 24). Water-snakes, Netting (88, p. 28).

Great Blue Heron, *Ardea herodias*, eats snakes, Baker (7); Barrows (11, p. 136); Howell (59, p. 25).

American Egret, *Ardea egretta*, eats small water snakes, Wilson and Bonaparte (120, Vol. 2, p. 300). Mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).

Egret, *Ardea* (?) *rufa*, eats snakes, mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).

Snowy Egret eats snakes, mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).

Little Blue Heron, *Ardea caerulea*, eats snakes, Baynard (14). Mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).

Louisiana Heron, *Ardea tricolor ruficollis*, eats snakes, Baker (7).

Green Heron, *Ardea virescens*, eats snakes, Baker (7).

Black-crowned Night Heron, *Nycticorax nycticorax naevius*, eats snakes, Baker (7).

Yellow-crowned Night Heron, *Nyctanassa violaceus*, eats snakes, Baker (7).

Whooping Crane, *Grus americana*, eats snakes, Netting (88, p. 28).

Sandhill Crane, *Grus mexicana*, eats snakes, Barrows (11, p. 150).

Virginia Rail, *Rallus virginianus*, ate a DeKay's snake, *Storeria dekayi*, and a garter snake, *Thamnophis sirtalis*, Cahn (25, p. 94).

Emu, *Droma novae-hollandiae*, eats snakes, Smith (105, p. 59).

Chickens, *Gallus gallus*, ate a red-bellied snake, *Storeria occipitomaculata*, Blatchley (20, p. 549). Garter snakes, *Thamnophis sirtalis*, DeKay (35, p. 45); Crimmins (32, p. 47).

Turkeys, *Meleagris*, eat garter snakes, *Thamnophis* species, Hay (56, p. 527). *Thamnophis sirtalis*, DeKay (35, p. 45); Saintleven (100).

Vultures eat living serpents, Wilson and Bonaparte (120, Vol. 3, p. 325).

Turkey Buzzard, *Cathartes aura*, (nestling) ate a house snake, *Lampropeltis*, Roddy (96, p. 245). Eats snakes, Barrows (11, p. 256).

Black-winged Falcon, *Elanus melanopterus*, eats snakes, Wood (122, p. 63).

Swallow-tailed Kite, snake hawk, *Elanoides forficatus*, eats snakes, Barrows (11, p. 260); Fisher (42); Howell (60, p. 37); Netting (88, p. 28). Seen carrying long, slender snakes, Audubon (4).

Mississippi Kite, *Ictinia mississippiensis*, eats snakes, Barrows (11, p. 261); Howell (60, p. 37); Netting (88, p. 28). Eats rough green-snake, *Opheodrys aestivus*, Wilson and Bonaparte (120, Vol. 1, p. 71).

Kites are large consumers of snakes, Baskett (12, p. 143).

Sharp-shinned Hawk, *Accipiter velox*, only occasionally snakes, Netting, (88, p. 28).

Goshawk, *Astur atricapillus*, only occasionally snakes, Netting (88, p. 28).

Marsh Hawk, *Circus hudsonius*, eats snakes, Fisher (42); Wilson and Bonaparte (120, p. 244); Howell (60, p. 37).

Buzzard, *Buteo*, (an African hawk) eats useful snakes, Fitzsimons (43, Vol. 2, pp. 34-35).

Buzzard, *Buteo vulgaris*, natural enemy of the viper, *Pelias berus*, and ringed snake, *Tropidonotus natrix*, Schmeil (102, p. 240). Snakes, Thorburn (115, p. 80).

Red-tailed Hawk, *Buteo borealis*, nestling ate a spreading adder, *Heterodon contortrix*, Over (91, p. 28). Rattlesnakes, Netting (88, p. 28).

Western Red-tailed Hawk, *Buteo borealis calurus*, eats snakes, Eliot (40, p. 151).

Krider's Hawk, *Buteo borealis krideri*, ate a blue racer, *Coluber constrictor flaviventris*, Gloyd (53, p. 141).

Red-shouldered Hawk, *Buteo lineatus*, eats snakes (almost exclusively in Florida), Barbour (9); Nicholson (90, Vol. 42, p. 35); Eaton (39, Vol. 2, p. 84); Howell (59, p. 39).

White-tailed Hawk, *Buteo albicaudatus sennetti*, eats snakes, Fisher (42).

Swainson's Hawk, *Buteo swainsoni*, occasionally brought snakes for its young. Ate a garter snake, *Thamnophis sirtalis*, and an entire rattlesnake, Cameron (26, p. 174 and pp. 282-283).

Golden Eagle, *Aquila chrysaeëtos*, very partial to snakes, Cameron (26, p. 382); Fisher (42). Prairie rattlesnake, *Crotalus confluentus*, Netting (88, p. 28).

Bald Eagle, American eagle, *Haliaeëtus leucocephalus*, eats snakes, Barrows (11, p. 288).

Jean le blanc Eagle, *Circaetus gallicus*, eats snakes, Wood (122, p. 38).

Eagles eat rattlesnakes and other snakes, Klauber (70, p. 13).

Serpent eagles, genus *Spilornis*, eat snakes, New Internat. Encyc. (89).

Harrier Eagle or serpent eagle, genus *Batastur*, (Asiatic and African) eats snakes, New Internat. Encyc. (89).

Bataleur, *Helotarsus ecaudatus*, (African) eats snakes. New Internat. Encyc. (89).

Jardine's harrier (Australia) very fond of small snakes, Wood (122, p. 94).

Harrier hawk, *Polyboroides*, (African) eats snakes, Fitzsimons (43, Vol. 2, p. 38).

Sparrow Hawk, *Falco sparverius*, ate red-barred garter snake, *Thamnophis sirtalis parietalis*, Blatchley (20, p. 548). Eats small snakes, Wilson and Bonaparte (120, Vol. 1, p. 30); Howell (59, p. 41).

Hawks eat rattlesnakes, genus *Crotalus*, and other snakes, Klauber (70, p. 13). Garter snakes, *Thamnophis*, Hay (56, p. 527). *Thamnophis sirtalis*, DeKay (35, p. 45).

Secretary-bird, serpent eagle, *Serpentarius secretarius*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, pp. 38 and 155); Baskett (12, p. 143); Barbour (9, p. 28); Daglish (33, p. 176). Poisonous snakes, Pycraft (95, p. 115). Eats cobras, three snakes as thick as a man's arm found in one, Wood (122, pp. 89-90).

Screech Owl, *Otus asio asio*, ate young garter snake, Allen (2, p. 6).

Burrowing Owl, *Speotyto cunicularia*, attacks live snakes, eats dead ones, probably eats small rattlesnakes, Netting (88, p. 28).

Burrowing Owl, *Speotyto cunicularia hypogaea*, eats Hammond's garter snake, *Thamnophis ordinoides hammondii*, (body of one photographed in burrow), McLean (79, p. 13).

Owls eat rattlesnakes and other snakes, Klauber (70, p. 13). Garter snakes, Hay (56, p. 527). Garter snake, *Thamnophis sirtalis*, DeKay (35, p. 45).

Road-runner, snake-bird, *Geococcyx californianus*, eats small snakes, Eliot (40, p. 162). Kills rattlesnakes, Myers (85, p. 2). Eats snakes, Barbour (9, p.); Cockerell (28). "Kills and eats rattlesnakes", Saintleven (100).

Ground hornbill, *Bucorax cafer*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, p. 126); Ingersoll (65, p. 16).

Bush kingfisher, *Halycon*, eats snakes, Fitzsimons (43, Vol. 2, p. 24).

Laughing jackass, *Dacelo gigas*, eats snakes, Ingersoll (65, Vol. 2, p. 24); Wood (122, Vol. 2, p. 170).

Rollers, *Coracias* and *Eurostomus*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, p. 22).

Magpie, *Pica pica hudsonica*, killed a rattlesnake, Boulder Daily Camera, Boulder, Colorado, June 4, 1895.

California jay, *Aphelocoma californica*, eats snakes, Beal (15).

Crow, *Corvus brachyrhynchos*, eats snakes, Barrows (11, pp. 424-425). Harmless snakes, Barrows and Schwartz (10, pp. 49-50). Milk snake, *Lampropeltis*, Wilson (121, p. 124).

Pied crow, *Corvus scapulatus*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, p. 1).

White-necked raven, ringhals, *Corvulture albicollis*, eats snakes, Fitzsimons (43, Vol. 2, p. 1); Wilson (121, p. 124).

Cowbird, *Molothrus ater*, nestling ate garter snake, Friedmann (47, p. 270).

Northern Shrike, *Lanius borealis*, eats snakes, Blanchan (17).

Loggerhead Shrike, *Lanius ludovicianus*, killed garter snake, ate DeKay's snakes, *Storeria dekayi*, Judd (67, pp. 100, 102). Eats snakes, garter snake, *Thamnophis sirtalis*, and a snake of the genus *Lepthophis*, impales snakes on barbed-wire fence, Judd (68, p. 21).

White-rumped Shrike, *Lanius ludovicianus excubitorides*, eats snakes, Cockerell (28).

Migrant Shrike, *Lanius ludovicianus migrans*, eats small snakes, Barrows (11, p. 563).

Shrike attacked a snake, Gignoux (51, p. 75).

Shrikes ate scarlet snakes, *Cemophora coccinea*, Ditmars (36, p. 274).

Robin, *Planesticus migratorius*, ate garter snake, McIntosh (76, p. 152); Marshall (80, p. 304); Simpson (104). Fed garter snake to nestling cowbird, Friedmann (47, p. 270).

Birds Eaten by Snakes

Massasauga, *Sistrurus catenatus*, eats young birds, Ditmars (37, p. 438). Probably small birds, Atkinson and Netting (3, p. 42); Netting (88, p. 26).

Pigmy rattlesnake, *Sistrurus miliarius*, eats very young birds, Ditmars (37, p. 436); Hurter (63, p. 212).

Banded or timber rattlesnake, *Crotalus horridus*, eats birds, Ditmars (37, p. 446); Netting (88, p. 26); Morse (84, p. 138); Forbush (44, p. 45); Hurter (63, p. 214). Small birds, Wood (122, Vol. 3, p. 101). An occasional bird, Stejneger (108, p. 432).

Rattlesnake (probably *C. horridus*) ate field sparrow, *Spizella pusilla*, and young, Nauman (86, p. 331).

Prairie rattlesnake, *Crotalus confluentus*, eats birds, Ditmars (37, p. 457). Occasionally birds, Over (91, p. 29).

Diamond-back rattlesnake, ate a quail, Stoddard (110).

Western diamond-back rattlesnake, *Crotalus atrox*, eats birds, Ditmars (37, p. 453).

Tiger rattlesnake, *Crotalus tigris*, eats birds, Ditmars (37, p. 460).

Copperhead, *Agkistrodon mokasen*, eats small birds, Ditmars (37, p. 424); Hay (56, p. 532). The smaller disabled birds, DeKay (35, p. 54). Birds, Hurter (63, p. 207); Netting (88, p. 26). Eggs and young, Forbush (44, p. 45). A sparrow, Surface (114 p. 189).

Cotton-mouth moccasin, *Agkistrodon piscivorus*, birds, Ditmars (36, p. 322 and 37, p. 419). Green heron's eggs, *Ardea virescens*, Howell (60, p. 103).

Fer-de-lance, *Bothrops atrox*, coiled up in nest of bird whose eggs or young it had devoured, Wood (122, Vol. 3, p. 98).

Puff adder, *Bitis arietans*, a large bird, Loveridge (73).

Viper, *Pelias berus*, eats birds, Wood (122, Vol. 3, p. 114); Palmer and Westell (93, p. 288).

Viper (in Pomerania) found in nest under dead buzzard, *Buteo vulgaris*, Cameron (26, p. 383).

Horned palm viper, *Lachesis schlegelii*, young birds, Ditmars (36, p. 348).

Ringhals, *Sipedon haemachates*, (a South African cobra) birds and eggs, New Internat. Encyc. (89).

Cobra de capello or hooded cobra, *Naja tripudians*, young poultry and birds, New Internat. Encyc. (89).

Spitting cobra, Black-necked cobra, chickens, struck hen in nest-box, Loveridge (73, pp. 109, 112).

Cobras, birds and eggs, Ditmars (36, p. 297).

Green mamba, *Dendraspis angusticeps*, probably killed black-bellied bishop bird, *Pyromelana nigriventris*, on nest, Loveridge (73, p. 115).

Genus *Elachistodon*, especially fitted for egg-eating, Boulenger (22, p. 393); Ingersoll (64, p. 57).

Egg-eater, *Dasypeltis scabra*, eggs and nestlings, Fitzsimons (43, Vol. 1, p. 240). Eggs, Wood (122, Vol. 3, p. 135); Forbush (44, p. 41).

Boomslang, *Dispholidus typus*, eggs, young and adults, Fitzsimons (43, Vol. 1, p. 240).

Boomslang, *Bucephalus capensis*, birds, Wood (122, p. 136).

Bird snake, *Theltornis kirtlandii*, eggs, young and adults, Fitzsimons (43, Vol. 1, p. 240).

Spreading adder, *Heterodon contortrix*, bird, Netting (88, p. 26); Surface (114, p. 185). Birds and eggs, Forbush (44, p. 45).

Western hognose, *Heterodon nasicus*, ate adult meadowlark, Branson (23, p. 377).

Blacksnake, black racer, *Coluber constrictor constrictor*, birds, Ditmars (36, p. 255). Birds and eggs, Ditmars (37, p. 282). Birds, eggs and young, DeKay (35, p. 36). Birds 4% of food, birds' eggs 4%, Surface (114, p. 169); Forbush (44, pp. 43-44). Catbird eggs, Morris (83, p. 253); Spencer (106, p. 108). Young catbird, Burroughs (24, pp. 27-30). Wren, quail eggs, Spencer (106, p. 108). Young Florida blue jay, Nicholson (90, Vol. 29, p. 190). Young blue jay, Linsdale (72, p. 557). Small birds, adult robin, Storer (112, p. 226).

Blue racer, *Coluber constrictor flaviventris*, eggs of red-wing blackbird, *Agelaius phoeniceus*, in nest of cardinal, *Cardinalis cardinalis*, eggs of vireo, and of red-winged blackbird, Nauman (86, pp.330, 331). Eggs of bobwhite, *Colinus virginianus*, prairie chicken, *Tympanuchus americanus*, and fowls, Morse (84, p. 128). Birds and eggs, Wood (122, Vol. p. 132); Force (46, p. 31); Netting (88, p. 26).

Racer, *Coluber semilineatus*, young Woodhouse jay, *Cyanocitta woodhouseii*, Stejneger (109, p. 155).

Coachwhip, *Masticophis flagellum frenatum*, small birds, Ruthven (98, p. 576).

Striped racer, *Coluber lateralis*, young house finch, Law (71, p. 179). Racers, genus *Zamensis*, feed principally on mammals and birds, Boulenger, G. A. (22, p. 323).

Coachwhip, *Masticophis flagellum flagellum*, English sparrows, Force (46, p. 30). Birds and eggs, Ditmars (37, p. 287); Hurter (63, p. 173). Attacked a hawk, Wood (122, Vol. 3, p. 132).

Coachwhips, *Masticophis*, birds, Ditmars (37, p. 287); Ditmars (36, p. 257). Young quail, Stoddard (110).

Dryophis prasinus, small birds, Boulenger, G. A. (22, p. 369).

Elaphe spiloides, eggs of guinea fowl, Hurter (63, p. 182).

Emory's coluber, *Elaphe laeta*, small birds, Ditmars (37, p. 299).

Davis Mountain coluber, *Elaphe subocularis*, small birds, Ditmars (37, p. 300).

Corn snake, *Elaphe guttata*, quail, two instances, Ditmars (37, pp. 301-302). Birds, Wood (122, Vol. 3, p. 130).

Pilot blacksnake, *Elaphe obsoleta*, hens' eggs, flickers, quail and other birds, Hurter (63, p. 180). Killed a large horned owl in captivity, Blatchley (20). Birds and eggs, Branson (23, p. 388). Birds' eggs, chickens, robins, red-winged blackbirds, crow blackbird, sparrows, eggs 2%, birds 28% of food, Surface (114, p. 161); Ditmars (37, p. 312); Forbush (45, p. 41); Netting (88, p. 26). Canary, Touissant (116, p. 222). Barn swallows, canary, Forbush (45, pp. 42-43).

Chicken snake, *Elaphe obsoleta confinis*, birds, young chickens and eggs, Hurter (63, p. 181). Birds, Corrington (31, p. 73).

Lindheimer's coluber, *Elaphe obsoleta lindheimeri*, hens' eggs, Ditmars (37, p. 306). Contents of birds' nests, Garman (50, p. 291).

Banded chicken snake, *Elaphe quadrivittata*, chickens, hens' eggs, Ditmars (37, pp. 311-312). "Habit of stealing chickens from roost", Wood (122, Vol. 3, p. 131).

Fox snake, *Elaphe vulpinus*, sparrows, birds and their eggs, Ditmars (37, p. 298); Surface (114, p. 162). Eggs of common tern, Lyon (75, p. 186); Williams (75, p. 186).

All culubers, birds and eggs, Ditmars (37, p. 294); Boulenger, G. A. (22, p. 330).

Indigo snake, blue gopher snake, *Drymarchon corais couperi*, Ditmars (37, p. 278).

Big cribo, *Drymarchon corais melanurus*, birds, Ditmars (37, p. 278).

Pine snake, *Pituophis melanoleucus*, birds, Surface (114, p. 171). Birds and eggs, hens' eggs, Ditmars (37, p. 318).

Bull snake, *Pituophis sayi*, birds and eggs, Hurter (63, p. 174). Birds and hens' eggs, Ditmars (37, p. 319). Birds, sparrows, pigeon's egg, Ruthven (97, p. 583); Branson (23, p. 360). Chewink and eggs, Nauman (86, p. 330). Young chewinks, Over and Thoms (92, p. 26). In wren's nest, Seiler (103). English sparrows, Force (46). Young blackbirds, Keller (69, p.). Eggs of Townsend's solitaire, Hunter (62). Glass nest egg, Trine (117, p. 4).

Speckled king snake, *Lampropeltis getulus holbrooki*, small birds, Hurter (63, p. 185); Force (46, p. 32).

Common king or chain snake, *Lampropeltis getulus getulus*, sparrows, Ditmars (36, p. 270, and 37, p. 362). Birds, a chipping sparrow, Blanchard (19, p. 52). Birds, Wood (122, Vol. 3, p. 131).

Boyle's king snake, *Lampropeltis getulus boylii*, contents of quails' nests, Blanchard (19, p. 78); Van Denburgh (70, p. 172).

Brown king snake, mole snake, *Lampropeltis rhombomaculata*, young birds, Ditmars (37, p. 355); Blanchard (19, p. 131).

Yellow-bellied king snake, *Lampropeltis calligaster*, young birds, Ditmars (37, p. 356).

Milk snake, house adder, *Lampropeltis triangulum triangulum*, bird, robin's egg, Surface (114, pp. 178-179). Birds, cowbirds' eggs, Blanchard (18, p. 48); Forbush (45, p. 44); Netting (88, p. 26). Eggs of red-winged blackbird, Nauman (86).

Grass snake (European) birds, Palmer and Westell (93, p. 228).

Water snake, *Natrix sipedon*, eggs and young of marsh wrens and rails, Forbush (45, p. 46).

Plains garter snake, *Thamnophis radix*, dead birds, Ruthven (97, p. 13).

Common garter snake, *Thamnophis sirtalis*, sparrow, Surface (114, p. 149).

Garter snake, *Thamnophis elegans*, dead birds, Ruthven (97, p. 13).

Garter snakes, *Thamnophis*, birds, New Internat. Encyc. (89); Fledgeling birds, Ruthven (97, p. 13). Bobolink eggs, Gabrielson (48). Young yellow warbler, Bigglestone (16). Eggs and young of birds, Forbush (45, p. 45).

Rubber boa, *Charina bottae*, very small birds, Ditmars (37, p. 212).

Anaconda, *Eunectes murinus*, waterfowl, Netting (88, p. 26).

Boa constrictor, birds, Schmeil (102, p. 241).

Boas, family *Boidae*, feathered creatures, Ditmars (36, p. 220); Netting (88, p. 26).

Rock python, *Python reticulatus*, "two 8-pound roosters every ten or twelve days", Netting (88, p. 27).

Pythons, birds, Stebbing (107, p. 183); Boulenger, G. A. (22, p. 245); Netting (88, p. 26).

Snakes, robbed two nests of prothonotary warbler in Louisiana, Ganier (49). Enemies of Bob-whites, Howell (60, p. 89); Catbird eggs, Over and Thoms (92, p. 26).

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THE WILSON BULLETIN

Published at Sioux City, Iowa, by the Wilson Ornithological Club.

The present editorial organization is as follows: T. C. Stephens, Editor-in-Chief, Sioux City, Iowa; Myron H. Swenk, University of Nebraska, Lincoln, Nebraska; Albert F. Ganier, Nashville, Tennessee; Alfred M. Bailey, Chicago Academy of Sciences, Chicago, Illinois; R. D. Hissong, Sioux City, Iowa.

The subscription price in the United States is $1.50 a year, and 50 cents a number; in all other countries of the International Postal Union the price is $1.75 a year, and 60 cents a number. Subscriptions and orders for single copies should be addressed to the Secretary, Dr. Jesse M. Shaver, Peabody College, Nashville, Tennessee, U. S. A.

EDITORIAL

THE NINETEENTH ANNUAL MEETING of the Wilson Ornithological Club will be held at Columbus, Ohio, on the three days following Thanksgiving Day, November 25, 26, 27, 1932. The sessions will be held on the campus of the Ohio State University, in the auditorium of the Ohio State Museum. The program will occupy Friday and Saturday. For Sunday a field trip is planned, with Buckeye Lake as the destination. The Christmas census last year yielded seventy-four species within a half-mile of the shore of this lake. The Wheaton Bird Club, of Columbus, will act as host. The Henninger collection of birds and the Bale collection of eggs will be features of interest. With the large Club membership in Ohio and adjacent states, this meeting may be expected to have a splendid program and a large attendance.

AS IS KNOWN to most of our readers President Shaver has been making a strong effort to increase our income this year so that there may be a minimum reduction in the size of our magazine. The response so far has been very encouraging, though everyone realizes, of course, that the problem is a serious one. Two of our members, Mrs. Carll Penwood Tucker and Mr. E. A. McIlhenny, have become life members. Others have contributed by changing their membership classification to a higher rank, and several have made cash contributions. A few authors are proposing to make contributions towards the cost of publishing papers. All of these aids are gratefully appreciated by the officers, and will help to carry us through. The officers are determined to avoid any deficit.

GENERAL NOTES

Conducted by M. H. Swenk

An Early Arrival of the Bobolink in Indiana.—On March 13, 1932, during a hurried trip to Ohio, as dusk approached and we were driving rapidly, we saw a lone Bobolink (*Dolichonyx oryzivorus*) fly up and across the road into a field. I could not understand how that bird could be in this part of the country at that early date, for I never previously had seen it before May 4, with one exception. It generally is found, according to my past records for ten years, between May 4 and June 13, although these dates may not be those of first arrival. One year (1924), the Bobolink was seen April 6. That was my earliest record before this year. But we have had unusual winters the past two years, hardly knowing winter had been with us. I believe the Bobolink had come upon the heels of the mild winter, before it knew it was not yet time for migration. As a rule these birds come in flocks, as I have seen fifty or more males together before they separate, making it evident, as with some other migrants, that the males come first together. The Robins do this, the males appearing about two or three weeks before the females. Many different varieties arrive together, then separate. I have seen the Bronzed Grackles, Starlings, and others all feeding on the ground together in the early spring. Warblers and other small migrants do the same. Birds of many varieties collect together in the fall before returning to the south, but when they are nesting they will have nothing to do with the other birds of various species.—Mrs. Horace P. Cook, *Anderson, Ind.*

Further Comment on the Nesting of the Blue-gray Gnatcatcher.—I have read with much interest the note of Mrs. Horace P. Cook, of Anderson, Indiana, (Wilson Bulletin, XLIV, p. 45), on the nesting of the Blue-gray Gnatcatcher (*Polioptila caerulea caerulea*). In more than forty years of observation I have never seen a nest of this species in a location other than on top of a horizontal limb. I have found them placed as Mrs. Cook describes, on top of the lower fork of a limb that branched vertically, so that the upper fork furnished some protection to the nest. Also, I have frequently noticed that the nests of both gnatcatchers and Ruby-throated Hummingbirds usually disappear in whole or in part soon after the young leave them, and the following incident suggests a reason.

I had located a Blue-gray Gnatcatcher's nest about thirty feet up in a slender oak, and a few days after the young had left it I went to the place to collect it. After shinning about two-thirds of the way up to the nest, I paused on a limb to catch my breath. In less than a minute a gnatcatcher came to the nest, and with much twittering began to pull material out of it. She soon had a bill full and flew away to the south. Thoroughly interested, I waited, and in a few minutes she returned and carried away another bill full of material.

I came down and followed her line of flight directly to where she was building a new nest. I had no means of knowing whether or not it was the same bird building a second nest from the materials of a first nest.—John B. Lewis, *Amelia, Va.*

Ground-Nesting Birds.—Two very unusual records of ground-nesting birds have come under my observation, one of the Eastern Mourning Dove (*Zenaidura macroura carolinensis*) and the other of the Brown Thrasher (*Toxostoma rufum*). In June, 1929, in crossing a field, I found where an Eastern Mourning Dove had

placed a few sticks to form a frail nest, which contained two white eggs, under a small overhanging tree, in the niche of the bank of a tiny stream. At New Vienna, in 1900, I found a Brown Thrasher's nest on the ground protected by a pile of osage-orange brush. In this section all of the early nestings of the Eastern Song Sparrow (*Melospiza m. melodia*) and of the Red-eyed Towhee (*Pipilo e. erythropthalmus*) are placed on the ground. The second nests of the season of the Eastern Song Sparrow are placed from two to ten feet up, in weeds, shrubs, and small trees. The Red-eyed Towhee most generally builds a couple of feet high in a shrub for its second nesting. An exception to this was the placing of a nest on a corn stalk where the leaf-blade joined the stalk, about three feet from the ground.—Katie M. Roads, *Hillsboro, Ohio.*

A Flight of Franklin's Gulls in Northwestern Iowa.—On September 17, 1931, I noticed about one hundred Franklin's Gulls (*Larus pipixcan*) resting in a compact group on Medium Lake, just north of Emmetsburg, Palo Alto County, Iowa. This was at 9 A. M. They arose and seemed to leave the lake soon after. The rest of the day I spent looking over game range in Palo Alto, northwestern Kossuth, and eastern Emmet Counties. Over almost all this territory there was a continuous body of gulls, evidently feeding on some flying insect.

Until evening the birds were flying at heights of fifty to one hundred yards. Toward evening they gradually grew lower, until at 5 P. M. they were on or near the ground level. At the same time my car began to pass through insects. Evidently the insects themselves had changed the level of their flight. Samples were collected and submitted to Carl Drake, State Entomologist, for identification. Unfortunately the specimens were mashed in the mails, so that the species could not be determined. Dr. Drake wrote me they were flea-beetles of some kind. This flea-beetle was evidently the attraction for the gulls.

The flight of gulls was observed over an area covering a total of four townships in Palo Alto, five in Kossuth, and four in Emmet Counties, a total of thirteen townships. It may have been actually much larger. On the other hand, the gulls may have accidentally followed our route of travel, and thus not actually covered thirteen townships. The density is estimated to have ranged from one to two hundred gulls to forty acres. Assuming that it covered ten townships and that the density averaged two gulls to forty acres, the total number of gulls would have been about thirty to the section, 1,100 to the township, or 11,000 gulls on the observed area. The density probably averaged much more than two gulls to forty acres.

Frank Marnette of Arnold's Park, Kossuth County, Iowa, a competent observer, tells me that these inland flights of Franklin's Gulls are a regular autumnal phenomenon, but that in his county every individual returns each evening to Spirit Lake to roost.—Aldo Leopold, *Madison, Wis.*

The Philadelphia Vireo Near Nashville, Tennessee.—On September 18, 1931, I was studying migrant warblers and vireos near my camp, Birds-I-View, some ten miles east of Nashville, Tennessee, when my attention was directed to the song of a bird about twenty feet away in an elm tree. Its notes were rather like those of a Red-eyed Vireo but more melodious, less continuous, and at times suggestive of the notes of the Purple Finch. Since vireos had practically ceased to sing I watched this bird very carefully as he moved sluggishly around just above my head. To my surprise there was a pale yellow color to the entire breast; and there were no wing bars as in the case of the White-eyed Vireo and

the Yellow-throated Vireo. Nor was it large enough for the Mountain Vireo. On consulting Chapman, I found that its markings, song, and habits corresponded exactly to those of the Philadelphia Vireo (*Vireo philadelphicus*).

On September 19 it was near the same tree but did not sing. Mr. A. F. Ganier attempted to collect a similar bird at this spot on September 20, but it was lost in the rank weeds. Nearly a week later I tried to take a specimen of this bird some five hundred yards farther south but was unsuccessful. The first bird, I am satisfied, was the Philadelphia Vireo; but in the other three instances there was no song to confirm the markings. My feeling now is that this species is more often to be found than records show and next spring all suspicious vireos will be given careful scrutiny. Perhaps we can add other records to the long record of Allison at Grand Junction, in west Tennessee, April 16, 1904.—GEORGE R. MAYFIELD, *Nashville, Tenn.*

The 1931 Fall Migration at Cleveland's Public Square.—This year's fall migration at the Public Square in Cleveland was not as productive in my observation as the past two years.

In the period from September 11 to December 28 I was successful in finding sixteen species of native birds. During this stretch of 108 days I visited the Square 83 days and found one or more birds on all but two days. The weather was uniformly favorable, with the temperature consistently above freezing, except for a brief cold snap with snow in the closing days of November. The temperature was frequently far above normal, reaching 63° on December 24, and nearly to that mark on several occasions. My records are as follows:

Species	*First Record*	*Last Record*	*No. of Days Seen*	*Largest No. in One Day*
Sparow Hawk	Sept. 11	Oct. 28	4	1
Herring Gull	Oct. 29	Dec. 15	2	7
Whip-poor-will	Oct. 9	.....	1	1
Yellow-bellied Sapsucker	Sept. 28	.....	1	1
Golden-crowned Kinglet	Oct. 9	.....	1	1
Ruby-crowned Kinglet	Sept. 28	Sept. 30	2	1
Magnolia Warbler	Sept. 16	.....	1	1
Black-poll Warbler	Sept. 12	Sept. 17	3	2
Northern Yellowthroat	Sept. 16	Sept. 21	4	4
Redstart	Sept. 12	.....	1	1
Savannah Sparrow	Sept. 16	Sept. 17	2	2
White-crowned Sparrow	Oct. 7	Nov. 17	13	4
White-throated Sparrow	Sept. 16	Dec. 28	75	14
Tree Sparrow	Nov. 11	Nov. 24	8	1
Song Sparrow	Sept. 21	Dec. 11	37	3
Rose-breasted Grosbeak	Sept. 16	.....	1	3

Most of these visitors are becoming familiar to me at the Square, but several of them were newcomers, notably the Whip-poor-will, Yellow-bellied Sapsucker, and Magnolia Warbler. The Whip-poor-will spent the day on the ledge of my office window, a windy day with the temperature around 55°. The bird showed no sign of injury, but seemed very weak. It exhibited no great fear of faces not more than a foot away on the other side of the window, rocking nervously when some one tapped on the glass. October 9 is some three weeks later than the usual time of departure for this species, and several cool days probably had made serious inroads on the bird's food supply. Three Rose-breasted Grosbeaks appeared together in the plane trees surrounding Tom Johnson's statue one day, all in the streaked plumage of the female or immature. White-throated Sparrows

occurred in smaller numbers than in past years but persisted later than previously. The Yellow-bellied Sapsucker worked on the trunk of a plane tree on a level with my eyes, not more than five feet away.

It is interesting to note that the Starlings were more numerous than ever and have stayed through the winter, coming in from the edge of the city every evening to roost on the cornices and string courses of buildings around the Square. Some observers have estimated that there are at least 15,000 Starlings roosting within a block of the Square, yet it is seldom that one is seen during the day.—WILLIAM H. WATTERSON, *Cleveland, Ohio.*

The Former Occurrence of the Mississippi Kite in Ohio.—In a considerable quantity of bones of birds from archeological excavations in Jackson County, Ohio, submitted to the National Museum for identification by the Ohio State Museum, I found two humeri of the Mississippi Kite (*Ictinia misisippiensis*), a species that has not been reported from Ohio previously, so far as I am aware. The bones in question were secured in Canter's caves, located about five miles northwest of the town of Jackson, in Jackson County, Ohio.[1] The caves in question are two rock shelters called Echo and Indian caves, respectively, located on the east side of Little Salt Creek, in a conglomerate many feet above the present stream level. The kite bones were associated with numerous other bird remains and quantities of human artifacts accompanied by several human skeletons.
Vol. 37, Jan., 1928, pp. 4-21, figs. 1-14.

The bird bones are in good condition and well preserved, all tendons and other tissues having disappeared. Their age is indefinite but probably dates back several hundred years. In the report cited in the accompanying footnote it is stated (p. 32) that "it seems indubitable that for the most part the occupants of the rock shelters of southern Ohio, in so far examined, were the Algonquian tribesmen of pre-Columbian and proto-historic times."

Nineteen species of birds were identified from the remains from Canter's Caves, including in addition to the Mississippi Kite bones of the Mallard, Blue-winged Teal, Ring-necked Duck, Lesser Scaup Duck, Wood Duck, Swallow-tailed Kite, Duck Hawk, Ruffed Grouse, Prairie Chicken, Bobwhite, Turkey, Passenger Pigeon, Barred Owl, Pileated Woodpecker, Flicker, Raven, Crow, and Grackle (*Quiscalus*).

One humerus of the Mississippi Kite has been presented to the U. S. National Museum, the other being retained by the Ohio State Museum.—ALEXANDER WETMORE, *U. S. National Museum, Washington, D. C.*

A Large Flock of Bank Swallows Near Toledo, Ohio.—Most of my readers are familiar with the great gatherings of swallows in late summer. Sometimes these conventions are of Bank Swallows, sometimes of Tree Swallows, or, too rarely in these days, of Barn Swallows.

Because of their proximity to the lake marshes, Toledo and its suburbs extending to the east play host to varying numbers of swallows each year. Up to 1931 the greatest flock I had ever witnessed was a flight of about 10,000 Bank Swallows (*Riparia riparia*) seen on July 15, 1928. This year, probably as the result of the drying up of all inland ponds, Bank Swallows were unusually common. The greatest number appeared on August 8, 1931, when the Little Cedar Point marsh, about ten miles or so east of Toledo, was visited by a huge flock of Bank Swallows, the number of which I estimated to be more than 250,000.

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[1]For an account of these sites see Shetrone, H. C., Ohio Arch. Hist. Quart.,

Even as I write this I seem to see thousands of eyebrows lifted in doubt, and I seem to hear scornful sniffs from every side. Two hundred and fifty thousand! Who counted them? Here was the situation: Along the west side of the Little Cedar Point property, between the marsh and Maumee Bay, a stone road bordered by large trees leads up to the clubhouse. Millions of gnats which had bred in the swamp rested on these trees during the day and swarmed forth in great clouds at dusk. These myriads of insects attracted Bank Swallows to such an extent that they formed a group about one mile long, measured by the speedometer, and 1,000 feet in width. The density of most of this constantly moving mass was almost unbelieveable. The scene resembled nothing more than a highly magnified section of the swarms of gnats upon which the birds fed. Mingled with the Bank Swallows were a few hundred Tree Swallows and Barn Swallows, Starlings, and a flock of Common and Black Terns.

The mathematics of the case is quite simple: Allowing each swallow twenty square feet, without making any allowance for the additional number resulting from figuring the third dimension also involved, 5,000 times 1,000 equals 5,000,000 gives the very conservative estimate of 250,000. Actually there may have been nearly a million.

This congregation marked the climax of the flight, although large flocks were seen both before and after that date, roosting on telephone wires along the roadside. This habit of roosting makes estimating numbers a very easy task for the observer. The count for the entire season is: July 12—100; July 18—200; July 26—3,000; August 2—8,000; August 8—250,000; August 15—30,000; August 23—50,000; August 30—500; September 7—50; and September 13—8.—Louis W. Campbell, *Toledo, Ohio.*

ORNITHOLOGICAL LITERATURE

Florida Bird Life. By Arthur H. Howell. Published by the Florida Department of Game and Fresh Water Fish, in coöperation with the Bureau of Biological Survey, United States Department of Agriculture. 1932. Pp. i-xxiv+1-579. Pls. 1-58 (37 in color). Figs. 1-72 (mostly maps). Price, $6.00 (to be ordered from the Department of Game and Fresh Water Fish, Tallahassee, Fla.).

The new year in ornithological literature opened with the distribution in January of Howell's "Florida Bird Life". This is another large, single volume, somewhat comparable with Bailey's "Birds of New Mexico", and also prepared through the coöperation of the United States Biological Survey. To make the comparison go further, this volume is also published through the generosity of a patron, Marcia Brady Tucker, of New York. The latter fact should be emphasized in order to express our gratitude and also as an example to others who may be philanthropically inclined toward science.

The text of this new work opens with a very full historical account of Florida ornithology. It seems to us that this is one of the most important parts of a work of this kind. There is also a section listing all of the birds which have been described from specimens taken in Florida, of which there are 82—a considerable number. The history of bird protection in the state makes a separate chapter written by Mr. Robert W. Williams. A chapter each on physiographic regions and life zones then brings us to the catalogue proper. The latter treats

423 forms, including 362 species and 61 additional subspecies. The routine account of each species includes statements on recognition marks, range, Florida distribution, haunts and habits, and food. Supplementing the text there are many state maps (about 71 of them) marked to show the distribution of a given species within the state. This we regard as the most valuable single feature of the book, even though the information may be incomplete in some cases.

Besides the text figures (maps) already mentioned, the chapter on life zones contains an inserted colored map of the state showing the distribution of life zones. Of the fifty-eight plates twenty-one are in black, and are reproduced from photographs by various artists. The remaining plates are in color and are reproduced from paintings by Francis L. Jaques. It has been the avowed intention of the artist to group his subjects together according to their habitat, rather than according to their relationships. This seems to be an innovation in the composition of modern bird pictures. We are not sure that we like it quite as well. Perhaps it leads the artist to give too much emphasis to the landscape, resulting in a corresponding reduction in the bird portraits. Most of the water bird plates are composed in this style, while the shore birds and land birds have been shown in the conventional way. Our preference would be for the shore bird plates. Possibly this is because we feel that the artist has been more successful in portraying the resting bird than the one in flight.

Mr. Howell is so well known through his connection for thirty-five years with the United States Biological Survey and his authorship of the "Birds of Arkansas" and the "Birds of Alabama", that the authenticity of the text may be accepted at face value. One by one the states are putting out their ornithological treatises in a sumptuous style hitherto almost unthought of; and made possible, doubtless, by the very great and widespread interest in the study of bird life. With these beautiful descriptive works now available, we are forced to reflect on the calamity which will befall the human world in each instance of extermination of these interesting creatures. It seems certain that each succeeding human generation will regard its bird life with increasing curiosity and concern. The present generation indeed owes much to the future in this matter.

A bibliography covering seventy-nine pages is probably quite complete, and is correspondingly valuable. A list of biographical references to students of Florida birds is a novel feature.—T. C. S.

Handbook of Birds of Eastern North America with Introductory Chapters on the Study of Birds in Nature. By Frank M. Chapman. Second revised edition. Published by D. Appleton and Company, New York, 1932. Pp. i-xxxvi+1-581. Pls. I-XXIX, figs. 1-166. Price, $5.00.

This book, the second contribution of the year to American ornithological literature, is the same "Handbook" as of other years, but modified to conform to the new A. O. U. Check-List in nomenclature and sequence. The Handbook has been in use so long and is so well known, that it is sufficient merely to announce the revised edition. Except for the new names and the altered sequence we see very little change from the last edition. The new edition contains, nevertheless, fifty-one pages more than the former one. There is the same preliminary study of "the bird", making an excellent practical introduction to ornithological knowledge, the value of which is enhanced by generous reference to other literature.

The bibliographical appendix is a most valuable portion of the book, and has been brought up to date in this last edition.

The older editions of this book are still good for identifications, but for technical names and sequence they will lead the student astray in many cases. It may be truthfully said that Chapman's Handbook is the lineal successor to Coues' Key; perhaps not so indispensable to the student as was the Key, because of the abundance of good bird literature now available in these modern days. Yet, every earnest student of birds requires a descriptive manual with keys dealing with all the birds of the larger territory in which his interest lies. The Handbook now meets this need in an admirable way. An interval of thirty-one years elapsed between the first and the last (5th) edition of Coues' Key. Now thirty-seven years have already passed between the first and the present edition of Chapman's Handbook, and it seems to be destined for many more years of usefulness.—T. C. S.

Effectiveness in Nature of the So-called Protective Adaptations in the Animal Kingdom, Chiefely as Illustrated by the Food Habits of Nearctic Birds. By W. L. McAtee. Smithson. Misc. Coll., Vol. 85, No. 7, pp. 1-201. Washington, D. C., 1932.

In the days before Darwin developed the theory of natural selection, color in animals was generally looked upon as accidental and non-significant. As the selection principal became better understood color patterns were interpreted as adaptive, i. e., protective. Some color patterns were explained as concealing in effect, so that natural enemies were prevented from finding and devouring the possessor. Other color patterns were regarded as revealing in effect, but were supposed to confuse or frighten away the predator. In all these cases of protective color adaptation the result was to preserve or "select" the possessor and allow him to reproduce. There is a discrimination in nature, therefore, in favor of those animals which possess some color or other protective adaptation. This is the principle of natural selection, briefly stated. Through this principle of selection the color pattern, often a specific characteristic, was believed to have originated and to have become perfected. Thus it became a method of evolution.

Mr. McAtee questions whether nearctic birds actually practice any discrimination in the capture of food animals because of the latter's possession of color pattern or other so-called protective adaptation. If these protective adaptations are serviceable to the owners there should be what might be called a differential death rate among them. And if there is such a difference in the death rate among the food animals of birds it should be discoverable in the stomach contents of birds. The author undertakes to show that most animals are used as food by nearctic birds (and presumably the rule will apply in general) in proportion to their abundance, regardless of "protective adaptations". In order to show this he finds the estimated totals of animals in each phylum, and then the percentage of species in each phylum to the whole number of species. For instance, there are estimated to be 418,250 species of arthropods, which is 74.6188 per cent of all known species of animals. Then it is found that from 80,000 bird stomachs examined in the U. S. Biological Survey since 1885, 237,399 species of animals have been identified. For instance, 210,752 species of arthropods were identified, which amounts to 88.7751 per cent of the whole number identified. The approximation of these two percentages is interpreted as indicating that the food

is taken at random and in proportion to abundance—not by selection of unprotected forms.

The several phyla are then examined by the same method, and a very strong case is made against color and other supposed protective adaptations, and for the theory of indiscriminate capture. The author says, "Within size limits, animals of practically every kind accessible to birds are preyed upon, and as we consider the records for group after group a tendency for the number of captures to be in proportion to the abundance of the animals concerned is unmistakable. Availability undoubtedly is the chief factor involved in the choice of food, and predation therefore tends to be in proportion to the population."

Our experience, derived from field observation without statistical measurement, leads us to acquiesce in the view that "predation tends to be in proportion to population". But a count of species is one thing and a population of individuals is something quite different. Birds are prone to feed heavily upon a species when it is at a numerical maximum or in a state or irruption. This excess of one insect species upon which birds may easily satisfy their appetities doubtless protects another species more than any color pattern which the latter may possess. We predict, however, that selectionists will not docilely yield ground which they have held, almost without dispute, for a generation. Mr. McAtee is boldly attacking a fundamental and far-reaching problem.—T. C. S.

WHAT BIRD IS THAT? A GUIDE TO THE BIRDS OF AUSTRALIA. By Neville W. Cayley. Published by Angus & Robertson, Ltd., 89 Castlereagh St., Sydney, Australia. 1931. Pp. i-xx+1-319. Col. Pls. I-XXXVI, halftones, 14. Price, 12/6.

It is seldom that we are privileged to review a bird book from the other side of the ocean, and we are glad to present this particular one to our readers. The book is organized around the thirty-six colored plates. Each plate shows diminutive figures of a number of birds, varying from ten to thirty. A section, or chapter, of the text is then devoted to the description of these figures on the accompanying plate. The sequence of species is not systematic, but rather ecologic. That is, species are grouped on the plates (also in the text) according to their habitats. While this plan of arrangement varies from the usual custom, we can not see that the scientific value of the book is lessened in the least, while its usefulness is probably increased. In this way the book pictures in color and describes 708 species of native Australian birds. And many of the plates show the female in addition to the male.

The text does not describe the plumage, since the figures are amply descriptive for ordinary identification; the text does, however, treat of the distribution, nest, eggs, food, song, habitat, etc. Furthermore, the text is not burdened with subspecies; and thus we have an example of a perfectly scientific and usable treatise based upon the species concept alone. How conservative and sensible the Australians are in this matter!

The outstanding feature of the book is the colored plates, which are also the work of the author. The large number of portraits placed on each plate precludes the use of any background. Nothing is shown but the bird in perching or standing posture. And while the figure is necessarily small, it is clear and distinct, and is as adequate for identification as a larger one would be. Considering the

large number of species illustrated and the preciseness of the coloring, even in such small figures, we are bound to regard the book as a marked success.

The book is sponsored by the Gould League of Bird Lovers of New South Wales. We are astonished in reading that the League has a membership of six hundred thousand. In view of this fact, however, it is not surprising that the first edition of 3,500 copies was exhausted within the month of publication (December, 1931), and that a second edition was promptly issued. It may be worth mentioning that the publishers have also on their list a book on the snakes of Australia, and one on the Platypus, and we have no doubt that many college libraries in this country will have special need for the latter work, at least (at 10/6).—T. C. S.

THE BIRDS OF LOUISIANA. Bulletin No. 20, Louisiana State Department of Conservation. Pp. 1-598. Distributed by the Department of Conservation, 126 N. O. Court Building, New Orleans. Price, 25 cents. Free to residents of Louisiana.

The first thing to be noticed about this work is its anonymity. In general people prefer to read from a known author, to say nothing of the justice of giving credit to the author. On page 522 this remark is made: "If one were forced to have only one favorite among the many appealing and beautiful warblers, the Hooded Warbler would be mine." This is probably an unedited reminder of the unknown author's role. The introduction gives some credit to Mr. Stanley C. Arthur, but there is no way of knowing, from the text, to what extent Mr. Arthur is responsible for the preparation of the work. In the "History of the Pelican Seal" of Louisiana we think we recognize Mr. Arthur's workmanship. However, it is difficult to understand the desire to suppress the authorship of a work which would otherwise be a credit to the State. It is also unfortunate that the numerous illustrations are not credited to either an artist or to previous publications.

One is much puzzled at first with the key of families of perching birds (pp. 394-395) until it is discovered that the printer has paragraphed the family name with the description below rather than the one above, simply by a misplacement of spacing. In most cases the treatment of a species is accorded a heading, but in some cases this is omitted. Apparently, the slight is given to some birds because they do not nest in, or visit frequently, the area under consideration.

The text contains many interesting and descriptive comments on the habits of our common birds in the southland. Special attention is given to the various vernacular names, and in many instances the origin or meaning of both vernacular and scientific names is given, often to the enlightenment of the experienced reader. A curious mixture of ornithological and editorial Latin, found on page 384 (and several other places), gives the scientific name of the Pileated Woodpecker as *Phloeotomus pileatus stet*—trinomialism inadvertently carried too far! Perhaps after all the author will be happier with the omission of his name from a work over which he had lost editorial control. However, notwithstanding these criticisms we are compelled to admit that in no other instance have we seen so much information on birds given for so little money.—T. C. S.

THE PHYSIOLOGY OF DEVELOPMENT OF FEATHERS. I. GROWTH-RATE AND PATTERN IN THE INDIVIDUAL FEATHER. By Frank R. Lillie and Mary Juhn. Reprinted from Physiol. Zool., Vol. V, No. 1, Jan. 1932. Pp. 124-184, pls. I-VIII.

This paper is based on studies conducted under the auspices of the Whitman Laboratory of Experimental Zoology, at the University of Chicago. The text reports on two main lines of investigation, namely, the feather development and the experimental modification of feather type and pattern. The studies were made on the Brown Leghorn fowl, which has been the subject of study by the authors for eight years. While barnyard fowls do not make a strong appeal to nature lovers, yet they serve just as well for the study of biological problems, and the principles discovered may then be applied to wild birds in general. To facilitate their experimental work the authors found it necessary to go into the matter of regenerative development of the feather germ after plucking or normal molting. It may be sufficient to say that the mode of development of the feather is restated clearly, and with new facts and figures. The experimental work consisted of injecting the birds with thyroxin and female sex hormone. It was found that varying quantities of these hormones produced alteration in the color pattern of the growing feather—usually in the form of bars. The general trend of the work seems to be an analysis of the cause of color pattern in terms of physiological factors. Asymmetry in structure and color of feathers is briefly discussed. A more difficult experimental problem will be that of composite plumage color pattern.—T. C. S.

BIRDS OF POLK COUNTY, IOWA. By Philip A. DuMont. Published by the Des Moines Audubon Society, 1931. Pp. 1-72. Price, 50 cents.

Besides the list of 289 species this paper gives a bibliography of twenty-two titles which deal more or less directly with the birds of Polk County. Perhaps this list is not complete, for we can name offhand three titles not in the list. Oberholser reported (1902) a specimen of *Otocoris alpestris praticola* from Polk County; Smith (1914) mentioned the Florida Gallinule in Polk County; and Bailey (1917) referred to a specimen of the supposed dark subspecies (*iowensis*) of the Broad-winged Hawk taken in Polk County. This specimen is mentioned in the catalogue, but the 1917 paper is overlooked. The author was wise in excluding (on present evidence) the Ground Dove from the list. It is rather surprising to find Swainson's Hawk listed as a "fairly common migrant"; we had regarded it as rare at present in the state. The misspelling of the word "species" has been mentioned in other reviews. The paper brings together a quantity of information for one of the representative portions of the state, and lays a splendid foundation for the larger problem of a state-wide report.—T. C. S.

THE PARASITIC HABIT IN THE DUCKS, A THEORETICAL CONSIDERATION. By Herbert Friedman. Proc. U. S. Nat. Mus., Vol. 80, Art. 18, pp. 1-7. Washington, D. C., 1932.

Attention is here called to the facts that often the eggs of the European Ruddy Duck may hatch without complete incubation, and that several species of ducks have the habit of laying their eggs in the nests of other birds; for example the Argentine black-headed duck is "regularly and entirely parasitic in its reproductive activities". These facts lead to some interesting speculation as to the origin of the peculiar habits.—T. C. S.

PROGRESS IN THE WESTERN DUCK SICKNESS STUDIES. By E. R. Kalmbach. Reprinted from Science, Jan. 8, 1932, Vol. 75, No. 1932, pp. 57-58.

This communication is a further report on the theory that the duck sickness is caused by the toxin of a bacillus. Previous reports (noticed in this magazine for June, 1931, p. 143) had indicated the presence of the bacillus, *Clostridium botulinum* Type C, in the tissues of birds dead from the disease and in the immediate environment of the sick birds. Now, the announcement is made that during the past year the toxin of *C. botulinum* Type C has been demonstrated in the bodies of birds dead from the disease, and also in the mud and water of their environment. These facts seem to satisfy the demands of bacteriological proof of the bacterial nature of the disease.—T. C. S.

"CHECK-LIST OF NORTH AMERICAN BIRDS. Prepared by a committee of the American Ornithologists' Union. Fourth Edition. Lancaster, Pa. (American can Ornithologists' Union) 1931. 8 vo. xix+526 pp. (Price 4 dollars).

"Under the leadership of Dr. Witmer Stone and with years of difficult work a committee of ten has prepared the long awaited Fourth Edition of the familiar 'Check-List', which is important because it not only forms the standards of nomenclature for the ornithologists of North America but also gives reliable information on the distribution of the birds of that continent at breeding-time and a survey of their migrations. The basis for the nomenclature of generic and specific names is indicated with great accuracy. In contrast with the Third Edition a number of essential revisions have proven necessary. In the arrangement of orders, families, and genera the classification worked out by Wetmore and Miller (1926) has been followed. The number of recognized genera has remained approximately as before; some genera of the Third Edition have been combined (as *Archibuteo* with *Buteo*, *Badytes* with *Motacilla*, *Astragalinus* with *Spinus*), while to about the same extent new divisions have been made (as the separation of *Moris* and *Sula*, *Phaeopus* and *Numenius*, *Thalasseus* and *Sterna*, *Melanitta* and *Oidemia*). If one draws a comparison with the nomenclature of the European ornithologists, which goes back essentially to Hartert, the fact must be admitted with regret that the gulf which separates the views on nomenclature on the two sides of the ocean is still large in spite of many attempts at approach, and that the gulf will probably not be closed very soon. This is manifested in the various decisions as to what constitutes a Genus. The Americans are far more inclined to split genera than we are, and the question arises if they are always fortunate thereby. The type of the genus *Turdus* is *T. merula* L. The American migratory thrush [Wanderdrossel=*Turdus migratorius*] is considered congeneric with our blackbird [Amsel] by the authors of the Check-List, in contrast with which they designate our red-thrush [Rotdrossel] '*Arceuthornis' musicus!* They call the common curlew *Numenius arquatus* (although Linnaeus wrote *Scolopax Arquata*, ex Gesner: *Arquata*); the whimbrel, or jack-curlew, on the other hand is *Phaeopus phaeopus*. The fairy tern, or shrimp-catcher [Zwergseeschwalbe=*Sterna minuta*], is placed with the picktarny [Fluszseeschwalbe=*Sterna hirundo*] in the genus *Sterna*, the Brandseeschwalbe [?] on the other hand is *Thalasseus*. Examples of that kind can be shown in still greater numbers. The agreement of the views regarding the treatment of species is equally small in innumerable cases. Here is clearly demonstrated that the European

ornithologists of the present have taken the lead in the question of the limits of species and are years ahead of their American colleagues. The latter still separate *Nettion crecca* and *N. carolinense*, *Somateria moilissima* and *S. v-nigra*, '*Astur*' *gentilis* and *A. atricapillus*, *Lagopus mutus* and *L. rupestris*, *Hirundo rustica* and *H. erythrogaster*, '*Nannus*' *troglodytes* and *N. hiemalis*, etc., as species; yes, in several cases they have even gone back beyond the point of view of the Third Edition in 'retrograde development', (for example, with *Arquatella* and *Junco!*). The goal of an internationally recognized nomenclature still lies in the distant future. In order to attain it, questions like the following must be settled for all time by general agreement: does *Eremophilus* exclude the later name *Eremophila*, and is Reichenbach's (1852) fixation of the genotype for *Colymbus* valid, etc.? The magnificent supplement 'The fossil birds of North America' from the pen of Dr. A. Wetmore is a valuable addition."—Dr. Erwin Stresemann, in *Ornithologische Monatsberichte*, Vol. 40, No. 2, March, 1932. [Translated from the German by Henry Rath].

Fall Migration of the Black Duck from Northern Michigan. By Miles D. Pirnie. Reprinted from Mich. Acad. Sci. Arts & Letters, Vol. XV, 1931, pp. 485-490.

It is here stated that the Black Duck "breeds in almost every county in Michigan". The paper is based on data obtained from banded birds. Of 845 Black Ducks banded in northern Michigan, 199 returns were secured These returns were distributed throughout the Mississippi Valley, with also a considerable number along the Atlantic Coast. The paper draws certain conclusions concerning the time of the movement and the dispersion.—T. C. S.

The Hawks and Owls of Ontario. By L. L. Snyder. Handbook No. 2, Royal Ontario Museum of Zoology. Pp. 1-48. Toronto, 1932. Price, 35 cents.

Nineteen species of hawks and eleven species of owls are treated in this pamphlet. There is a general description of each species, with a careful statement of the economic status—the latter in most cases being illustrated by a circular percentage diagram.—T. C. S.

Usefulness of Birds on the Farm. By W. L. McAtee. Farmers' Bull. No. 1682, U. S. Dept. Agric. Washington, D. C., 1932. Pp. 1-13. Price, 5 cents.

This bulletin contains much new information, and serves as a good summary of the general economic status of these birds.—T. C. S.

Food Habits and Economic Status of the Brewer and Red-winged Blackbirds. By Pablo S. Soriano. Reprinted from Calif. Fish and Game, Vol. 17, No. 4, Oct., 1931. State Fish and Game Commission, 510 Russ Bldg., San Francisco.

We find in this paper a very extensive examination into the economic status of the two species in question. Much evidence was collected, and the conclusion was reached that both species are more beneficial than harmful, and that they should be protected during the breeding season. But it was also recognized that because of their gregarious habits after the breeding season they may become locally destructive, and may then be reduced in numbers in fairness to the farmers.—T. C. S.

A Bibliography of Tennessee Ornithology. By Jesse M. Shaver. Journ. Tenn. Acad. Sci., VI, No. 4, Oct., 1931, pp. 179-190.

This list of titles contains 237 items, and we note that the greatest number of titles by one author is thirty-eight, by A. F. Ganier. Those who have not attempted it will perhaps scarcely realize the amount of work involved in assembling even an approximately complete bibliography. The publication of one is always of great value to the progress of any particular phase of science—it fixes the progress that has been made up to that point.—T. C. S.

Birds of North Louisiana. By George H. Lowery. Bull. La. Polytechnic Inst., XXIX, No. 4, 1931, pp. 1-60. Published by the Polytechnic Institute, Ruston, La.

This paper reports on 252 species and subspecies of birds observed in Louisiana north of latitude 31°. Most of the study hitherto given to the birds of this state has been made in the southern part of the state. The northern part, which seems to have been neglected, is treated in the present paper.—T. C. S.

Birds of Sioux City, Iowa. By Walter W. Bennett. Published by the Sioux City Bird Club, 1931. Price, 10 cents.

This pocket booklet of eighteen pages lists 293 species and subspecies. The evidence for a number of forms admitted is not convincing. Even if specimens are not insisted upon, the documentary evidence is not fully presented. The reviewer knows of no evidence of the former abundance (or even occurrence) of the Passenger Pigeon in the vicinity of Sioux City. The Glossy Ibis mentioned is an immature specimen, and is more probably a White-faced Glossy Ibis (*guarauna*). Perhaps a dozen other species in the list are open to question of one sort or another. For the most part, however, it is a useful list for the purposes for which it was intended.—T. C. S.

The Seasons of Birds in Central Ohio as Shown by Six Years' Migration Records. Compiled by Charles F. Walker. Published in Ohio State Mus. Bull., Vol. I (date not shown).

In this paper Mr. Walker has attempted to compile the dates of arrival and departure of the birds and from an area of central Ohio comprising all or parts of several counties, and which may be called the Columbus region. The table is based on observations obtained during the years of 1922-1927. A list of winter birds for the same region is appended.—T. C. S.

Ohio Game and Song Birds in Winter. By Lawrence E. Hicks. Bulletin of of the Bureau of Scientific Research, Division of Conservation, Vol. I, No. 2, Jan., 1932, pp. 1-68. Columbus, Ohio.

Mr. Hicks has prepared a very useful manual on the winter care of wild bird life. The subject is treated under six heads, viz., 1) emergency feeding in winter, 2) report on experimental field work, 3) conservation and checks on natural increase, 4) planting of food crops for birds, 5) list of all Ohio winter birds—to the number of 159, and 6) a bibliography of literature. Ten halftone reproductions of photographs make interesting illustrations.—T. C. S.

THE CALIFORNIA GROUND SQUIRREL CONTROL PROGRAM. By Eugene S. Kellogg. Calif. Dept. Agric. Special Publ., No. 109. Pp. 1-21. Sacramento, 1931.

Apparently this paper is prepared as a defense against attacks on the widespread use of poison for rodent control purposes in California and other parts of the west. The paper discusses the need of control of rodents, the occurrence in rodents of disease to which man is susceptible, and the secondary effects of poisoned bait on other forms of wild life. The paper concludes with a direct reply and criticism of the much-quoted article by Dr. Linsdale in the *Condor* last year. Innuendo is used repeatedly to asperse the validity of Linsdale's "facts", but it seems to us that the author has been careful to avoid an unequivocal denial of the facts. After all, to the general observer and conservationist it makes very little difference whether the deaths were caused by one kind of poison or another.—T. C. S.

To the *Migrant* Mrs. Sanford Duncan contributes two notes on "snakes vs. birds"; in the last December number one note records that a small snake was found in a Mockingbird's nest containing eggs; in the last March (1932) number she also reports the capture of a full grown flicker by a bullsnake. Messrs. Dillon and Ganier, in the December number, record the nesting in Tennessee of the Prairie Horned Lark. The *Migrant* is an 8-page quarterly, the subscription is fifty cents per year, and the Editor is Mr. George B. Woodring, 1414 Stratton Ave., Nashville, Tenn.

In the March, 1932, number of the *Gull* Mr. C A. Harwell gives a few notes on the Water Ouzel. He records that during one period of observation "the birds submerged twelve times in twenty seconds, rested ten seconds; submerged eight times in fifteen seconds, rested twelve seconds; submerged twelve times in twenty seconds". The *Gull* is a 4-page monthly, $1.00 per year, Mrs. A. B. Stephens, Editor, 1695 Filbert St., San Francisco.

The *Audubon Annual Bulletin* (Illinois) for 1932 contains sixty-four pages of text and pictures. Two very interesting photographs attract attention, one of Benjamin F. Gault with the late Robert Ridgway, and another, a very unusual flashlight picture of a deer in the wild. Many short articles make up an excellent number.

During the past few months we have received the following mimeographed publications: the *Yellowstone National Park Nature Notes*, issued monthly in the office of the Superintendent, Yellowstone National Park, Wyoming. *The Raven*, monthly organ of the Virginia Society of Ornithology, edited by Dr. J. J. Murray, Lynchburg, Va. *The Flicker*, quarterly organ of the Minnesota Bird Club, edited by Gustav Swanson, 3305 47th Ave., S., Minneapolis, Minn. *The Chickadee*, monthly organ of the Forbush Bird Club, Worcester, Mass. This is a new periodical, but from copies we have seen we have not learned the subscription price nor business address; however Dr. W. Elmer Ekblaw, Clark University, Worcester, Mass., is president of the club and can give information. *Inland Bird Banding Notes*, quarterly organ of the Inland Bird Banding Association, Edward R. Ford, Secretary, 7077 Ridge Ave., Chicago, Ill. *News from the Bird Banders*, quarterly organ of the Western Bird-Banding Association, Museum of Vertebrate Zoology, Berkeley, Calif. *Bird Banding Notes*, issued by the Bureau of Biological Survey, U. S. Department of Agriculture, Washington, D. C.

From Our President

During this time of financial stress, it is very important that bird study and nature work be not neglected. For those who can see and hear, nature offers solace, quiet, and sanity. Never was it more essential for people to keep their feet on the ground, and to have a means of getting away for a time from the toil and strife of everyday life. Never has it been more desirable to keep up the work of organizations like the Wilson Ornithological Club, and to exert every effort to encourage people to hold their faith in the natural world, and in the world of man as well.

With these things in mind your President has been writing personal letters to the membership urging that they contribute to the resources of the Club by raising the membership rank, or in other ways. The need is a real one, but it is temporary; and we will be glad to see our organization pass through the crisis in a creditable manner. Our chief duty concerns the publication of the magazine. Can you assist?

Jesse M. Shaver, *President.*

From Our Secretary

Today many scientific and educational projects are being curtailed or abolished because of financial difficulties. Conservation, bird study, and wild life interests in general are receiving setbacks. Because of this they need our attention more now than ever before. We have but one choice—to go on.

Some of our members have been forced to discontinue. Those of us who remain must go on with increased enthusiasm. We hope that each member may do something to increase our membership. The Secretary will be glad to receive the names of any prospective members, to whom he will then extend the invitation to membership. Our organization has weathered the storm of existence for forty-four years, and there is no question of survival; but we dislike to give up ground that we have laboriously gained. If you can help, perhaps this is the time.

Lawrence E. Hicks, *Secretary.*

Annual Meetings of the Wilson Ornithological Club

	Retiring President
1914—Chicago. February 5. Chicago Academy of Sciences.	
1914—Chicago. December 29-30. New Morrison Hotel	T. C. Stephens
1915—Columbus. December 28-29. With the A. A. A. S.	T. C. Stephens
1916—Chicago. December 27-28. New Morrison Hotel	T. C. Stephens
1917—Pittsburgh. January 1-2, 1918. With the A. A. A. S.	W. F. Henninger
1918—No meeting on account of the exigencies of war	M. H. Swenk
1919—St. Louis. December 29-30. With the A. A. A. S.	M. H. Swenk
1920—Chicago. December 27-28. With the A. A. A. S.	R. M. Strong
1921—Chicago. December 26-27. The Field Museum	R. M. Strong
1922—Chicago. October 26	T. L. Hankinson
1923—Cincinnati. Dec. 31, 1923-Jan. 1, 1924. With the A. A. A. S.	T. L. Hankinson
1924—Nashville. November 28-29-30. Peabody College	A. F. Ganier
1925—Kansas City. December 28-29. With the A. A. A. S.	A. F. Ganier
1926—Chicago. November 26-27. Chicago Academy of Sciences	A. F. Ganier
1927—Nashville. Dec. 30, 1927-Jan. 1, 1928. With the A. A. A. S.	Lynds Jones
1928—Ann Arbor. Nov. 31-Dec. 1, 1928. Museum of Zoology	Lynds Jones
1929—Des Moines. December 27-28. With the A. A. A. S.	Lynds Jones
1930—Cleveland. December 29-30. With the A. A. A. S.	J. W. Stack
1931—New Orleans. December 28-29. With the A. A. A. S.	J. W. Stack